GROW YOUR OWN

Complete HANDYMAN ENCYCLOPEDIA

do-it-yourself

26

QUINCE

WATERCRESS

GLOSSARY-INDEX

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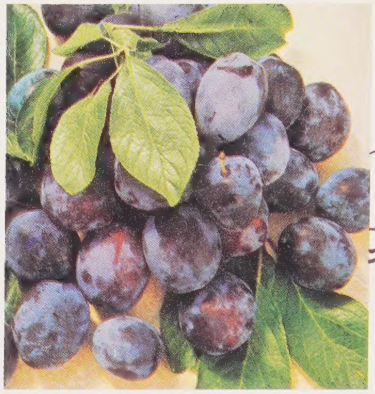

do-it

low yield

medium yield

high yield

minimum effort

needs more care

requires special attention

crops in three months or less

crops in 4-12 months

crops in over 12 months

Complete Handyman yourself Encyclopedia

A STEP BY STEP GUIDE TO SUCCESSFUL
VEGETABLE AND FRUIT GROWING
BASED ON ALL 52 GARDENING HANDBOOKS
PUBLISHED UNDER THE TITLE

VOLUME
26
QUINCE
WATERCRESS
GLOSSARY
INDEX

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growing ideas

Old-fashioned Favorite

Add a touch of the old-fashioned to your garden by planting a quince tree. Its unusual fruit has a delicious aroma and makes first class pies and preserves.

The quince (*Cydonia vulgaris*) is an old-fashioned "country cousin" of cultivated apple and pear trees; although not as widely planted as it used to be, its beauty when in flower and the sharp, unusual flavor of its bright yellow pear-shaped fruit can make it a popular choice for the home grower. The fruit never becomes sufficiently soft or sweet to be eaten raw, but quinces harvested in late autumn used to be highly valued for the jam, jelly, marmalade and preserves made from the strongly scented pungent flesh, and can still be used for these purposes. Quinces make particularly good jelly, with a quite individual flavor. One slice of quince added to an apple pie or flan transforms the taste into something special and exotic, and a bowl full of quinces can fill a whole room with their lemony scent.

Although no one is sure exactly where quinces originated, they have been cultivated in warm Mediterranean climates for centuries. Today, they are widely grown in Portugal, Italy and the south of France. In cool temperate climates, they are not grown commercially, perhaps because the weather is too harsh, and with apples and pears so abundant and inexpensive, quinces are hard to come by in the stores. However, they are not at all difficult to cultivate, and because they are self-fertile, a single tree will supply you with plenty of its delicious fruit.

Remembering their Mediterranean habitat, try to select a warm, sunny spot for your tree, well out of the way of strong winds and frost pockets. It is a good tree to choose for a courtyard site, and is equally suitable as a specimen tree on the lawn as in the fruit garden. This is because, as the tree grows older, its shape becomes widespreading and very picturesque, with an ultimate height of about 16 ft (4.8 m); this "oriental" appearance is much more interesting than that of the usual standard fruit tree. The quince becomes particularly decorative in winter, when its pale gray bark and intricate branching system are easily seen. Its oval leaves, dark green above and white-felted underneath, add to its attractiveness, and the large white or pale pink flowers, typical of the *Rosaceae* family, are an extra bonus in spring. In mid- to late autumn, the leaves often turn a rich deep shade of yellow before falling; because of these decorative qualities, as well as its food value, it can truly be considered the perfect choice for a one-tree-garden.

Quinces prefer a soil which is neutral or slightly acid rather than limy, and moisture-retentive without being waterlogged. If you are lucky enough to have a stream or pond in your garden, then plant your quince nearby, as the trees seem to do better in moist (but well-drained) soils. However, remember that where water collects is often the lowest point, and so cold or frosty air may also build up and interfere with cropping.

You can grow quinces from seed, but it is a painfully slow way to proceed, as you may have to wait up to twelve years

Marshall Cavendish

▲ *Quince fruit and flowers are decorative, and the tree makes an attractive garden feature.*

before the seedling tree comes into bearing. It is a much quicker and safer bet to select one of the named varieties available from your nursery or garden center. *Orange* is perhaps the best-known and most widely grown. It is an early cropper. *Pineapple* is grown in California and has a flavor that hints of pineapple. Named varieties of quinces generally start cropping when they are four to eight years old.

If your tree is container-grown it can be planted any time of the year, barring extremes of weather; open-grown trees, i.e. those which are bare-rooted, are planted in autumn or early spring. Remember to prepare the location thoroughly beforehand, and give the newly planted quince the support of a strong stake. Allow a 10 ft (3 m) spacing between bushes, and twice that distance between standard trees. Their general cultivation is very similar to that for other fruit trees. On moist fertile soils, the quince requires little manuring but, like pears, responds well to surface mulches of rotted manure or garden compost. Weed regularly. Pruning is minimal, and is usually confined to the cutting out of overcrowded, unproductive or damaged branches. Long sideshoots are cut back as for pears.

Old-fashioned Favorite

Harry Smith

▲ *Quinces ripening on tree; picking begins in autumn, and lasts several weeks.*

In autumn, the fruit begins to change from green to pale yellow. Leave the fruit on the tree right through and into late autumn, to allow a touch of frost to improve the flavor. Try to pick the fruit when the weather is dry to avoid rotten, unstorable crops; ripe quinces will still be quite hard, though the seeds should have turned dark brown to black. In cool temperate climates they can normally be picked any time over a period of several weeks, and will then mature slowly through the winter.

For storing, select only sound, healthy fruit and put them on a shelf in a cool, dry place, such as a cellar or shed. Make sure none of the fruit is touching, and check them regularly for signs of rot. Remember that the ripening fruit gives off a pronounced aroma which can adversely affect apples and pears, so store them away from these fruits.

Quinces are generally trouble-free, although they are sometimes infected with leaf spot—small red spots appear on leaves, later turn brown as do the leaves themselves. If you have had such trouble in previous years, it is a good idea to spray with an approved fungicide at leaf-bud-burst and again when the fruit has set. Leaf-curling aphids, and leaf-eating caterpillars may appear, but are normally not of any great trouble.

Common garden names often cause great confusion, and the "flowering quince" ("japonica") of cottage gardens is not a true *Cydonia,* but a member of a related genus, *Chaenomeles.* These ornamental quinces are among the most beautiful and easily cultivated of early flowering shrubs; their large, saucer-shaped flowers often open on the bare branches before the leaves have appeared, in late winter or early spring. There is a wide range of flower color available, from brick red, through vermillion, crimson, pale salmon, to pink and white. They are undemanding as to site and soil conditions, and will grow happily trained against a north wall or in poor soil. They have a dense, bushy habit of growth, and eventually reach a height of 5 ft (1.5 m). Treat their yellow, quincelike fruit in exactly the same way as true quinces, cooking them in cakes, pies or preserves. *Chaenomeles speciosa* is the common japonica which, in most years, will set yellow rounded fruits; the much less common *C. cathayensis* grows long green fruit, up to 6 in (15 cm), which make better jelly than japonica fruits. *Chaenomeles "Crimson and Gold"* makes an excellent, freely suckering hedge; its bright red flowers with yellow stamens are particularly beautiful. Like cydonias, pruning is minimal; those trained against a wall should be pruned after flowering, in late spring. Cut back the flowered growth to leave two or three leaf clusters.

Flowering quinces are susceptible to scale insects and fire blight. Groups of tiny scales—black, brown, white or yellow—cluster on older shoots, particularly in late spring and summer. Use an approved insecticide. Fire blight is a bacterial disease which causes flowering spurs to die and leaves to wither, with cankers developing at their bases. To treat this disorder, all infected material must be pruned—cutting at least 4–6 in (10–15 cm) below the diseased area—and destroyed. Pruning shears must be disinfected between each cut. Spray with an approved control.

step-by-step growing guide

Radishes

Raphanus sativus (fam. *Cruciferae*)
Grown as hardy annual
Sowing to harvesting time: three to six weeks for spring and summer varieties, eight weeks for winter varieties
Size: varies with type, spring and summer radishes average 1 in (2.5 cm) in diameter, winter radishes much larger, weighing up to 1 lb (0.45 kg) each
Yield: 4 lb (1.8 kg) per 10 ft (3 m) row for spring and summer varieties; 10 lb (4.5 kg) per 10 ft (3 m) row for winter varieties

Radishes are one of the easiest and quickest vegetables to grow, giving a high yield of crisp roots with minimum effort. Because their cultivation needs are so few, and quick-growing varieties can be harvested three weeks after sowing, growing radishes is one of the best projects for children as an introduction to gardening. Radishes are, of course, an extremely useful crop in general; they can be sown between other plants, as catch crops, or in the odd corner of the garden. As long as the soil has been prepared properly and the plants do not run short of water, a good crop will be ready for pulling a short time after sowing. In mild climates by protecting against the extremes of winter and summer weather, you can harvest good crops of radishes all year round.

Most commercially grown radishes, seen in the supermarkets in spring and summer, are the round red variety. The amateur gardener has a much wider selection of varieties from which to choose. Besides red radishes, there are white, yellow, red and white, and black-skinned types, round, long and tapering or oval in shape. Some varieties are suitable for early forcing, others are grown for autumn and winter harvesting. Abroad, packets of mixed strains are available; these contain seeds of several varieties of mixed colors, shapes and sizes. The different varieties of radish in these packets mature at different times, so the season of harvesting will be extended.

The most familiar types of radishes are the round red one and the slightly longer red and white type, which are popular for garnishing and for use in summer salads. These are sweeter tasting than some long white varieties that have a peppery flavor and are also used in salads. The slower growing winter varieties form enormous roots, weighing up to about a pound (½ kg) each, and can be red, white or black-skinned, with white flesh. Some are pungent and tasty, but not sweet. They can be cooked like turnips or eaten raw, in which case they are sliced or grated, rather than served whole. Winter varieties are peeled before eating but spring and summer varieties are eaten whole.

Harry Smith

▲ *Early radishes are quick growing and ready to pull three or four weeks after sowing.*

Suitable site and soil

Success with radishes depends to a large extent on soil conditions. The soil must be rich and moist; warm, light fertile sandy soil is best. As with most other root crops, manuring the soil right before sowing is not a good practice as it leads to coarse, badly shaped roots. You can lighten heavy clay soil by adding peat. Very dry soil can also be improved by the addition of peat, which increases the moisture-holding capacity of the soil. Whatever the soil type, it should be deeply dug well before sowing, and worked to a very fine tilth. There should be no lumps in the top 6 in (15 cm) of soil. Work in sifted leafmold or ripe sifted garden compost, and add a dressing of bonemeal at the rate of 4 oz per sq yd (120 g per sq m).

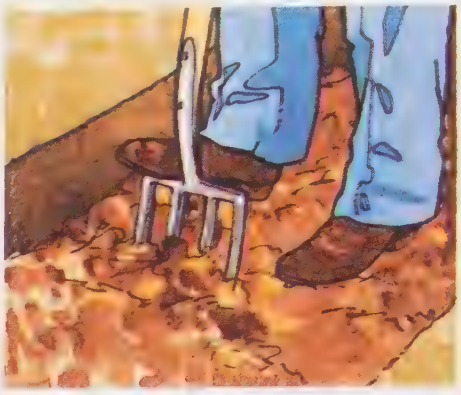
Site requirements vary according to the time of year. For early outdoor sowings, a warm, sunny, sheltered site is best, preferably with a south-facing slope. From early summer onward, radishes need a cool, shady position. If they are grown in full sun during the summer months, they tend to bolt (run to seed). Do not, however, plant them in a dry, shady place, such as under a hedge, or you will have a disappointing crop of thin, drawn roots. Shade given by pea or bean plants is ideal. If you are planting radishes in early autumn, select a sunny open site, protected from frosts if possible. Later sowings need glass protection or a mild climate.

Sowing in the open

Like lettuce, radishes should be sown little and often. Because most varieties are at their best for only a short while after reaching maturity, there is no point in sowing an enormous number of seeds at

PREPARATION AND SOWING

1. Well before sowing, dig the soil deeply; add moist peat to very dry or very heavy soils.

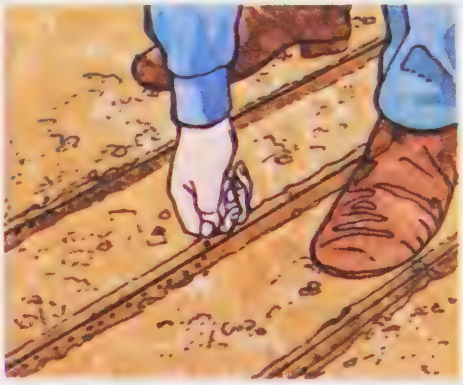


2. Work in sifted leafmold or ripe garden compost; avoid digging in heavy manures, which can cause badly shaped roots.

3. Work in a top-dressing of bone meal at the rate of 4 oz per sq yd (120 g per sq m), or apply a dusting of superphosphate.

4. Just before sowing, rake the soil surface to a fine tilth and break up any lumps of soil, especially in the top 6 in (15 cm).

5. Make the drills ¾ in (1.9 cm) deep, and 4–6 in (10–15 cm) apart; be sure they are absolutely level.



6. Sow the seeds thinly; overcrowding leads to abundant foliage rather than to root growth.

one time. Successional sowing, every two or three weeks, will give a continuous, reasonable harvest. An average packet of seeds will be plenty for sowing three 10 ft (3 m) rows, and should produce at least 300 radishes. If you have more seeds than you need, you can share them with friends or store them; under proper conditions, the seeds will retain their vitality for five years.

Radishes are often intercropped with other vegetables—sowing them, for example, on the ridges adjacent to celery trenches. When intercropping in this way, make sure the radishes will not interfere with hoeing and weeding, and there is enough space for access to both crops.

Radish seeds are sometimes mixed with slow-germinating seeds, such as onion or parsnip. Their distinctive heart-shaped seed leaves mark the rows and the radish roots are soon ready for pulling, leaving space for the long term crops to grow. When you are mixing radish seeds in with another crop, make sure you remove all small slow-growing radishes as soon as the bulk of the radish crop is pulled, to avoid crowding the long term crop.

If you have a very warm, sheltered site, you can sow in the open in early or midwinter. Do not attempt very early outdoor sowing if the soil is cold, wet and heavy. To improve drainage and to speed growing in winter-sown radishes you can make a slightly raised hotbed in the open. Cover the electric cable with a 6 in (15 cm) layer of fine soil. Some people sow early crops of radishes outdoors in the 4 in (10 cm) gap between seed-row covers. The covers protect the radishes from wind and keep the soil slightly warmer, but you may have difficulty caring for and harvesting the radishes when grown in this way.

Normally outdoor sowings are made from early spring onward. Sow in drills ¾ in (1.8 cm) deep and 4–6 in (10–15 cm) apart. Make sure the drills are dead level, so that all the seeds are covered with the same depth of soil.

Radishes must be sown thinly. If you sow them too thickly, you will get a very poor crop; overcrowding leads to foliage rather than root growth. Try to aim for 12–15 seeds per 1 ft (30 cm) run. Because the seeds are relatively large, you should have little difficulty in sowing them this thinly.

After sowing, rake the soil gently over the radishes to cover them. Never cover the seeds with more than ¾ in (1.9 cm) of soil. Then firm down the soil, with the back of a rake or spade. The seeds should germinate from four to ten days after sowing. If thinning is necessary, it should be done as soon as the seedlings are large enough to handle. The smaller salad varieties should be spaced 1 in (2.5 cm) apart; the larger salad varieties 1½–2 in (3.8–5 cm) apart.

Radishes for fall or winter harvesting should be sown in mid to late summer in drills 9 in (23 cm) apart, and thinned if necessary so that there is 6 in (15 cm) spacing between plants.

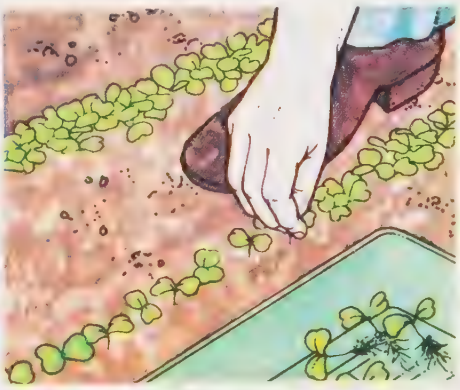
A less satisfactory method of sowing radish seeds is sowing them broadcast instead of in drills. Although initially easier and quicker to do, broadcast sowing has several drawbacks. It is much more difficult to control weeds because the radishes are sown over a large and indefinite area; hoeing becomes impossible. Because you cannot control the density of sowing, you will also have more thinning to do. Like other root vegetables radishes do not transplant very well, so the thinnings will be wasted.

Sowing under glass

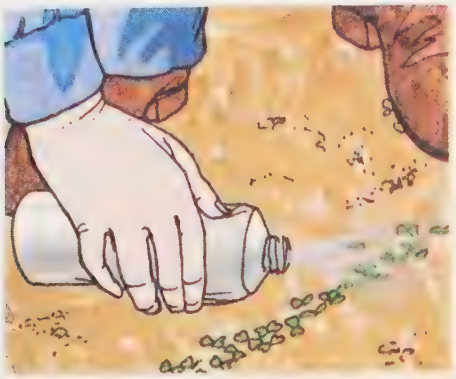
The earliest radishes of all can be had by growing them on a hot bed in a cold frame in early to midwinter. For sowing under cold frames select varieties with short leaf growth. Cover the electric cable with 6 in (15 cm) of good soil. Do not mix very much fertilizer with the soil as it is the heat and not the rich fertilizer which is essential. Mixing the radish seeds with carrot seeds is an excellent way to make the best use of the frame. The radishes should be ready for pulling in three weeks, and the carrots can grow

CULTIVATION AND HARVESTING

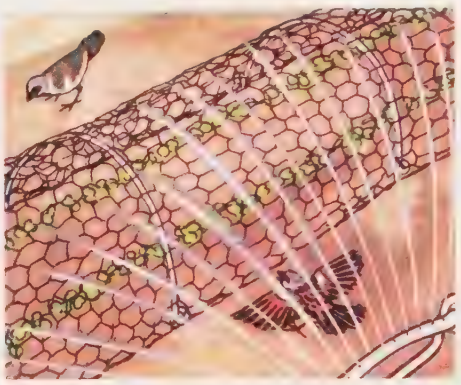
1. After sowing, tamp down the soil with the head of a rake, so the seeds are in contact with the soil.



2. Thin the seedlings as soon as they are large enough to handle, to 1–2 in (2.5–5 cm) apart.

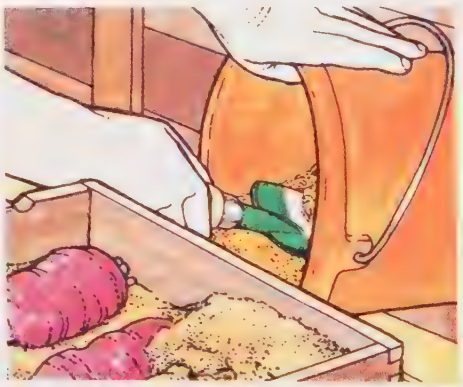


3. Dust seedlings with Sevin powder as they emerge and again 10 days later, to avoid damage by flea beetle.



4. Protect the seeds and seedlings from birds with small mesh wire netting, scarecrows or webs of thread.

5. Harvest radishes as soon as they are ready; do not leave them in the ground to get hot and stringy.



6. Large winter radishes can be pulled in autumn and then stored in a box filled with damp sand.

on. You can sow the radishes in a cold frame in early spring without a hotbed, but it will take six to eight weeks before they are ready for pulling. Another method of giving glass protection to very early crops is to sow radish seeds in the soil of a heated greenhouse. Radishes grown under glass should be a minimum of 3 in (7.5 cm) apart, with 6 in (15 cm) between rows with more space for large types.

Under protective covers, radishes can be sown between rows of early lettuce or peas. Grown on their own, five rows of radishes will fit under an average size cover; with this protection they can be grown outdoors from early spring onward, though cropping may take longer.

Care and development

For early sown crops under glass and in the open, protection from frost is essential. Cover hotbeds and frames with newspapers or sacks if a frost is expected. It is best to open the frames during the day to keep the plants well ventilated once they have germinated, shutting the frame at night and covering as necessary. For radishes sown in the open or in cold frames, a covering of litter or mats at night helps protect the plants from frost damage. Remove the covering during the day, unless the weather is very cold. A 6 in (15 cm) layer of clean straw or branches of evergreen trees or shrubs are also useful for covering the plants in milder climates.

Moisture is essential; water regularly in warm weather and particularly during the summer. Radish crops will fail if they are checked by lack of water. If you have prepared the ground properly, weeds should not be a problem. Radishes grow very quickly and should be ready to pull before any weeds have time to become established.

Birds like radish seeds and seedlings; if necessary protect them with small mesh wire netting, scarecrows or webs of black thread. Birds do not seem to attack radishes past the seedling stage, so the protection need only be temporary.

To avoid damage by flea beetle, dust the seedlings with Sevin powder as they appear and again about ten days later to insure control of the pest.

Although summer radishes do not need additional fertilizers, winter radishes benefit from a dressing of nitrogen in early autumn. Apply it at the rate of 1 oz per 10 ft run (30 g per 3 m run) to help the radishes make good growth before winter. A lawn food will do.

Harvesting

Summer radishes are normally harvested three to four weeks after sowing, while they are still young and crisp. If you leave them in the ground until the flowering stems develop, the roots become stringy and have a hot, unpalatable taste. If you have a bumper crop, and more radishes are ready for pulling than your family can sensibly use, harvest them and share them with friends or neighbors. If there is still some surplus, put them on the compost heap, as they are rich in nutrients and make good compost. There are some varieties, such as Cherry Belle and Crimson Giant, which can remain in the ground for relatively longer periods without splitting or going to seed. The best way to avoid a glut, however, is by frequent and small sowings.

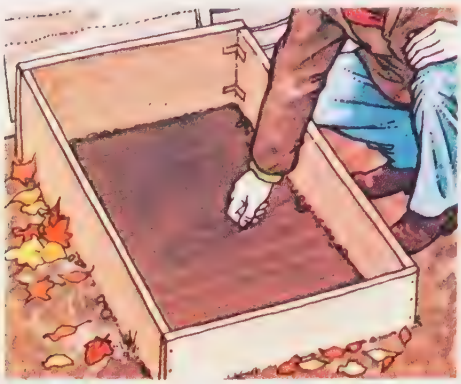
Large winter radishes can either be harvested in autumn and stored in damp sand like carrots, or left in the ground and lifted as needed. They will not become hollow in the center, as do summer radishes if they are left in the ground for any length of time.

Radishes grown in hotbeds must be watched very carefully and picked as soon as they mature because they are at their best for only a few days.

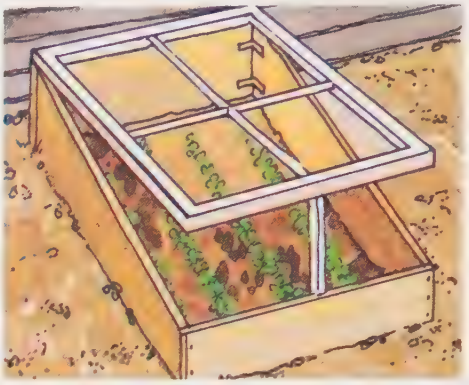
Exhibition tips

Although three to four weeks is the average time from sowing to harvesting, it can vary according to weather conditions. Because it is difficult to time the radishes exactly for a particular show date, it is best to make a few small sow-

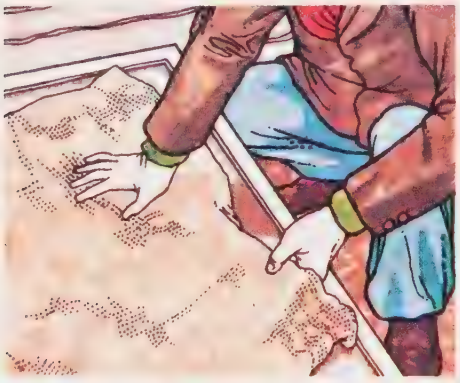
GROWING WITH PROTECTION



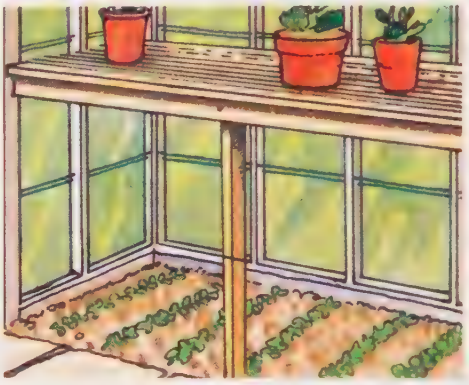
1. Sow seed under glass from late winter onward. Sprinkle the seeds thinly at a depth of ¼ in (0.5 cm).



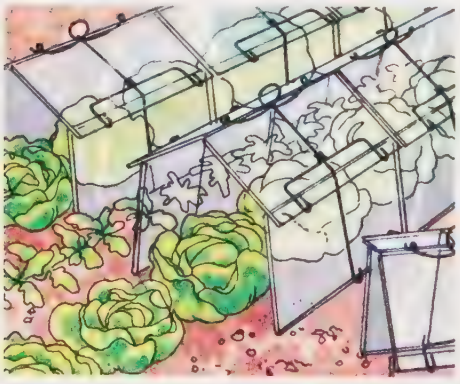
2. Once the seeds have germinated, open the frame during the day; shut it at night to keep the cold out.



3. If you expect a frost, cover the frame glass with sacking or paper to protect the seedlings.



4. You can also sow radishes in the soil of a heated greenhouse; make the rows 6 in (15 cm) apart.



5. Early radishes can be grown outdoors between rows of protective covers used for forcing other crops.

ings at weekly intervals, starting six weeks before the show date.

Do not gather the radishes until just before the show, to avoid wilted foliage. Twenty-four radishes is often the number shown; dig up three times that number, if you have them, so you can select the best roots. They should be as uniform as possible, and all one variety unless otherwise stated. Do not select enormously large radishes, as they are not necessarily prize winners. Select roots of moderate size for the particular variety, as texture, color and freshness are more important than size.

The judges will look for fresh, brightly

Bernard Alfieri

With glass protection during winter months, you can harvest radishes in milder areas.

colored roots with the foliage still attached. Old, very small or very large roots, with tough spongy flesh will be considered defective. Avoid exhibiting radishes with long or trimmed foliage or with flowering stems showing.

Just before the exhibition, wash the radishes under running water until all the soil is removed, and tie the roots in a bundle with green twine. Display them with the roots pointing toward the front of the table or place them on a plate.

Brian Furner

▲ *Black Spanish*

Pat Brindley

▲ *Chinese Rose*

Varieties

For fall or winter crops

Champion: 20 days. Large-topped; roots large, bright red, round. Good for extra early or late crops; fusarium susceptible.

Chinese Rose: 55 days. A large round rose-colored winter radish.

Chinese White (Celestial): 55 days. White; 6–8 in (15–21 cm). Least pungent of winter types.

Round Black Spanish: 55 days. Skin is black, flesh white; to 4 in (10 cm) diameter. Crisp and pungent; stores well.

Summer radishes

Red Boy: 22 days. Scarlet Globe type; early. Good on muck soils.

Red Prince Improved: 24 days. Globular; fine taproot. Fusarium resistant.

Summer Cross Hybrid: 45 days. Giant, white; oriental type. Crisp, mild, sweet; 6–14 in (15–36 cm) but not pithy.

Forcing radishes

Cavalier: 21 days. Tops small; roots globular. Good in muck soils.

Cavalrondo: 24 days. Flesh firm, bright brick red. Slightly oval; small tops.

Cherry Belle: 24 days. Good for main

Pat Brindley

▲ *French Breakfast*

Brian Furner

▲ *Cavalrondo*

Pat Brindley

▲ *Yellow Gold*

Harry Smith

▲ *Scarlet Globe*

crop or forcing. Round and firm; taproots fine.

Scarlet Globe Forcing: 21 days. Good short-topped strain of old favorite; ideal for greenhouse or early planting out.

Spring or maincrop

Burpee White: 25 days. Mild, crisp; exceptional long-lasting tenderness but best when not over 1 in (2.5 cm).

Comet: 25 days. Round or olive-shaped; short-topped. Also good for midsummer sowing.

Crimson Giant: 29 days. Late, large but not pithy or hollow.

French Breakfast: 23 days. Oblong; scarlet with white tip. Mildly pungent.

Scarlet Globe Special: 23 days. A favorite; mid-sized globe. Good under unfavorable conditions.

Sparkler: 25 days. Crisp, juicy, snappy flavored; white tipped.

Stop Lite: 23 days. New, bred for earliness and long life in garden; bright red, globular.

White Icicle: 28 days. Icy-white, crisp, mild; 5 in (13 cm). Best picked young.

Yellow Gold: 25 days. Gold outside, white inside; ideal for salads. Egg-shaped, medium-flavored.

Pat Brindley

▲ *White Icicle*

Pat Brindley

▲ *Summer Cross Hybrid*

Pests & Diseases

Radishes are pleasantly trouble-free; because they grow so quickly they are usually harvested well before disease or pests can do much damage. However, like other members of the *Cruciferae* they are subject to infection by several fungal diseases.

Damping-off: this disease is caused by a fungus and infected seedlings will collapse and die at ground level. It is particularly likely to occur if the seedlings are overcrowded or grown in very close, damp conditions. The best preventive measures are to sow seeds thinly and thin them if they are at all overcrowded. Avoid sowing in very wet conditions. Treated seeds are less vulnerable. If damping-off does occur, spray the soil with a soil disinfectant.

White blister: if glistening white pustules appear in rings on the leaves of your radishes, they are probably infected with the fungus known as white blister. Although not a serious disease this does disfigure the crop. It is most likely to occur if the radishes are crowded or weak. If white blister does occur, remove and burn all infected leaves. The weed shepherd's purse harbors white blister, so make sure your garden is free of this and other cruciferous weeds.

Downy mildew: this is another fungal disease encouraged by poor cultivation. It appears on seedlings and young plants usually on the undersides of the leaves, as white tufts or downy patches. Remove and destroy infected seedlings or leaves. If the plants are badly infected, spray with an approved fungicide.

Club root (finger and toe): this fungal disease usually infects brassicas, but radishes are occasionally damaged. The symptoms are bluish and wilting leaves, and swollen black rotting roots which have an unpleasant odor. It is most likely to occur on acid, badly drained soils, so make sure any drainage problems and excessive acidity are corrected before planting. Fungicide dust sprinkled in the seed drills before sowing offers some protection. Apply it as recommended on the label.

Scab: this fungal disease appears as circular, sunken scabby patches on the

Ministry of Agriculture, Fisheries & Food

▲ *Fungal infections appear as woolly growths on roots or leaves. Wet or crowded conditions are usually responsible.*

Ministry of Agriculture, Fisheries & Food

▲ *White downy patches on radishes are the result of severe infection with downy mildew; it is encouraged by poor cultivation.*

roots, although occasionally the patches may be raised. The infection is most likely to occur on light, gravelly, hungry soils lacking in organic matter. The most effective preventive measure if your soil is light is to dig in plenty of well-rotted manure, leafmold or vegetable compost well before planting. Avoid overliming your soil as excessive lime seems to encourage the disease.

Flea beetle: these are the only pests likely to harm radishes. They eat small circular holes in the seedlings and young leaves and will eat older leaves until they are skeletonized and lacelike. They are particularly active in sunny weather from mid to late spring. Adult flea beetles vary in size and color, but are usually dark blue or black, occasionally with yellow stripes. Because the beetles hibernate in garden debris or rubbish in hedge bottoms, practicing good garden hygiene is the best preventative measure. Because they feed on weeds of the *Cruciferae* family, such as shepherd's purse and charlock, make sure your garden is weed-free. Never leave stumps of Brussels sprouts or cabbages in the ground after winter because flea beetles will feed on them until they can move onto new crops.

If your radishes are healthy and growing thickly, it is unlikely that flea beetles can do severe damage. Water the radishes in dry weather to make sure they are not checked. If the beetles do appear, dust beds with derris or Sevin.

GUIDE TO RADISH TROUBLES

Symptoms	*Probable causes*
Seedlings collapsing at ground level	Damping-off
Rings of white pustules on leaves	White blister
White downy patches on undersides of leaves	Downy mildew
Bluish wilting leaves, swollen, foul-smelling roots	Club root
Circular sunken dark scabby patches on roots	Scab
Small circular holes, especially in leaves of seedlings	Flea beetle

Ministry of Agriculture, Fisheries & Food

These radishes show the main symptom of scab: circular sunken scabby patches on the roots. It is most likely to occur on light soils.

Ministry of Agriculture, Fisheries & Food

These swollen and distorted roots are infected with club root, a fungal infection associated with badly drained soils.

step-by-step growing guide

Raspberries

Rubus idaeus (fam. *Rosaceae*)
Hardy perennial prickly cane with a useful life of 12 years
Size: up to 8 ft (2.4 m) high unpruned; kept to about 4–5 ft (1.2–1.5 m) when fruiting
Yield: 3–7 lb (1.5–3 kg) per plant or 25–49 lb (11–22 kg) per 10 ft (3 m) row
Planting to harvesting time: 2 years

Of all soft fruit, raspberries are most suited to home growing. As they do not travel or keep well, raspberries freshly picked from your garden are likely to be far superior in quality and taste to store-bought ones. This is because most commercial varieties are not particularly flavorful, but have been bred to produce fruit which have the ability to withstand the rigors of packing and transport. By growing your own, you can choose from a wide range of flavorful varieties, and by planting for successional cropping, you can enjoy fresh raspberries from early summer through to the first autumn frosts.

Raspberries give very quick returns, and are second only to strawberries in the length of time from planting until cropping. Although the everbearing varieties will produce some fruit the first season they are planted, it is best not to allow them to do so. By pinching out the flowers as they appear, you are encouraging the young plants to develop strong plants and root systems instead of fruiting, and the canes should then produce heavy crops from the second season onward. Unlike strawberries, which need replanting every two or three years, well cultivated raspberry canes will continue to be fruitful for at least twelve years.

Red raspberries cultivated in the United States are hybrids of the European red raspberry, *Rubus idaeus,* and the North American native variety, *R. strigosus.* Two other types are grown in the United States—blacks and purples—which are quite different from the reds in flavor. Black-fruited raspberry varieties, derived from *R. occidentalis,* are much more popular in America than Europe, and are widely cultivated here. Unlike the red raspberry, which has a spreading habit of growth, black raspberries are clump-forming, with heavier and more branched canes.

Purple-fruited raspberries are hybrids of reds and blacks and more vigorous than both. Black raspberries are grown in the eastern United States and Oregon, while purples are grown extensively in western New York State and occasionally in other states and in Canada. There are also richly-flavored yellow varieties (sometimes known as white raspberries). Actually, they are mutant versions of red types and differ only in color.

Raspberries flower and fruit on laterals growing from canes which were pro-

PLANTING

1. In early spring, plant canes about 3 in (7.5 cm) deep; spread roots out and firm soil thoroughly.

2. After planting, cut canes back to a strong healthy bud, about 1 ft (30 cm) above ground.

duced the previous year, after which the fruiting canes die, and are replaced by new canes. Although most varieties fruit in midsummer, there are some types which are specifically cultivated for autumn crops. These autumn fruiting (everbearing) raspberries produce fruit on the tips of the current season's shoots. Fruit quantity may be smaller than that of summer fruiting canes. Summer and autumn fruiting varieties require slightly different methods of pruning, but neither method is particularly difficult or time consuming.

Suitable site and soil

Raspberries do best in a sunny site, but being woodland plants, they will tolerate some shade. Because they flower relatively late in the season, frost is not usually damaging and low-lying sites can be satisfactory for growing raspberries in most years, unless there is a very late frost. They will not tolerate waterlogged soil, however, and in very wet winters, excessive water may kill the roots.

Besides soil drainage, shelter from wind is the second major consideration. The canes are fairly brittle and may snap off in high winds, and the point where the fruiting laterals join the canes is also very vulnerable to serious damage from strong winds.

The best soils are deep, rich, well-drained loams, as long as they retain some moisture in dry weather. Shallow sands and gravels can be made suitable, if you are prepared to water them frequently and give a continual supply of nutrients. Likewise, heavy clay soils are not really suitable without careful preparation and maintenance because they tend to harden and crack in dry summers depriving the shallow roots of water. Raspberries will accept more acid conditions than most other soft fruits, but readily become chlorotic in an alkaline soil. Shallow soils over limestone should be avoided.

Because some viral infections are soil-borne by eelworms, avoid planting new canes in sites previously occupied by berries of the same genus and plant as far away as possible from old fruiting canes.

Begin soil preparation well in advance. Remember that the plants will remain in the ground for at least 12 years and no amount of aftercare will make up for inadequate preparation. Whatever the soil type, make sure the ground is completely free from perennial weeds, such as couch grass, bindweed and nettles. If the subsoil is hard and impervious to water, break it up with a fork. Then fork in well-rotted manure at the rate of 2½ gal (12 L) per plant. At the same

time, apply superphosphate, at the rate of 1 oz per sq yd (30 g per sq m). If manure is not available, use garden compost, leafmold or moist peat. If the soil is alkaline or nearly so, and using it for raspberries is unavoidable, work in fritted trace elements at the time of planting at the rates recommended by the suppliers.

Planting out

Buy canes which are virus-free and plant in early spring. Because raspberries break into fresh growth very early in spring, later plantings should be avoided. If, however, the ground is very wet or cold when the canes arrive, you can heel them in until conditions are more suitable.

Dig out a shallow trench about 1 ft (30 cm) wide where the row is to be. Space the canes 18 in (45 cm) apart; if you have more than one row, leave a minimum of 5 ft (1.5 m) between rows. This may seem wasteful of space, but the canes must be exposed to enough air and sunlight for the fruits to ripen properly. Closer planting will also encourage problems with pests and diseases. If you are planting varieties which are slow to sucker, you can plant two canes per prepared site.

Plant the canes firmly, with the roots well spread out and about 3 in (7.5 cm) deep; there should be a soil mark on the stems indicating the right planting depth. After planting, at once cut the canes back to a strong healthy bud about 1 ft (30 cm) above ground. This may seem a bit drastic, but if you do not cut the cane back and allow it to fruit in the first season, the plant's ability to produce vigorous new canes will be seriously reduced, and it may not crop properly for another two years.

Should there be any heavy frosts after planting, check the newly planted canes; if any have been lifted by frost, firm them down.

Erecting training wires

There are two basic methods of support. The quicker method, as it does not involve tying individual canes, is to have two rows of parallel wires through which the canes grow. To do this, erect stout end posts, at a maximum distance of 16 ft (4.8 m) apart. At 2 ft (60 cm) and again at 5 ft (1.5 m) bolt onto the end posts crosspieces of wood about 1 ft (30 cm) long, to act as spacers. Then run wires (telephone wire is best) from one crosspiece to the other, fixed with a brace at each end (see diagram). The young canes are then trained to grow up between the wires, and the canes inside the wires tend to support each other. There is one disadvantage to this system: in high winds, serious damage can occur, and if the canes get too overcrowded, they are more vulnerable to disease.

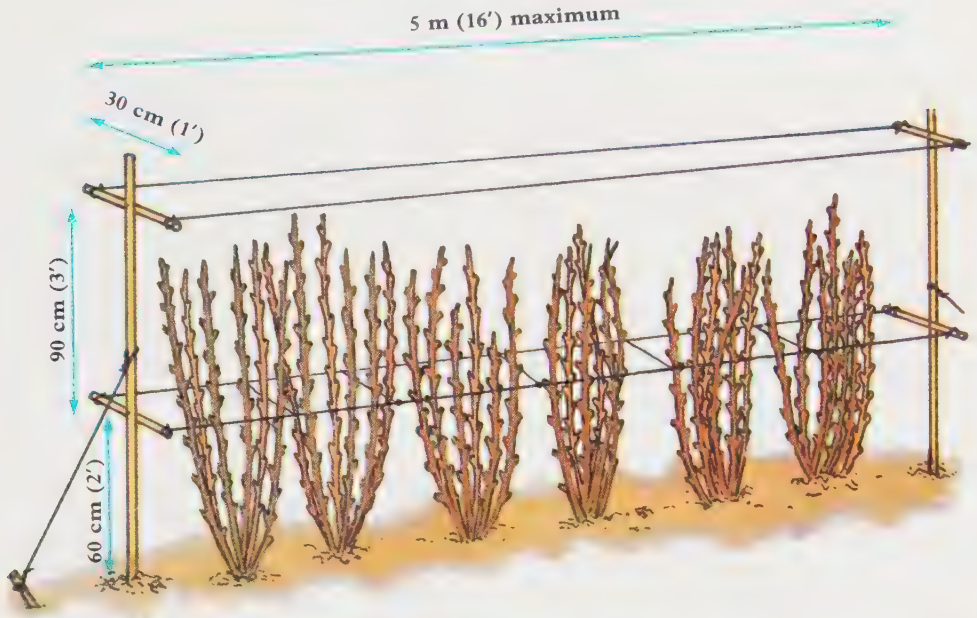
The slightly more time-consuming, but better method of support is to tie the canes individually to parallel horizontal wires as they grow. Drive 7½ ft (2.3 m) poles 1½ ft (45 cm) into the ground at each end of the row. The first autumn after planting, erect horizontal wires at 1½ ft (45 cm), 3½ ft (105 cm) and 4–5 ft (1.2–1.5 m) depending on the vigor of the variety. Then tie the young canes individually to the bottom wire with soft garden twine, and to the middle and upper wires as soon as they are tall enough.

Training and pruning

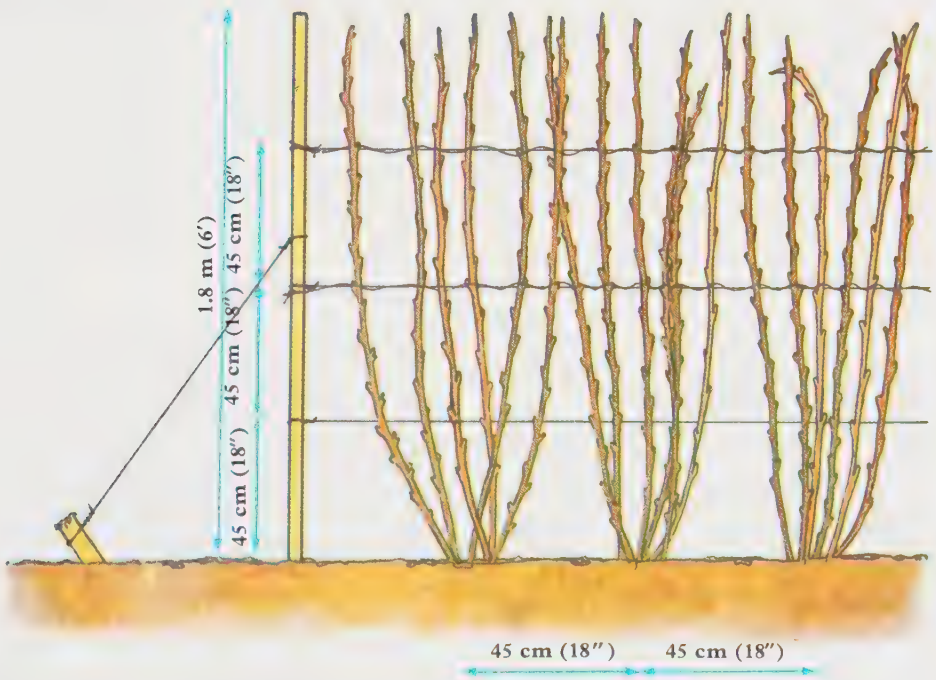
The young canes grow from adventitious buds; without training or pruning the plant would quickly form an impenetrable thicket of stems. Because the root system is very wide-spreading, new canes may appear some distance from the parent plant.

The first summer after planting, cut out the old canes entirely when the young canes reach 10 in (25 cm) high. The following late winter, tip prune all the canes slightly. Strong growing ones should be cut back to a good bud about 6 in (15 cm) above the top wire; less strong growing canes should have the top 3–4 in (7.5–10 cm) removed. This winter tipping, which should be done annually, will get rid of any diseased and damaged cane tips, and it will also encourage the

TRAINING WIRES

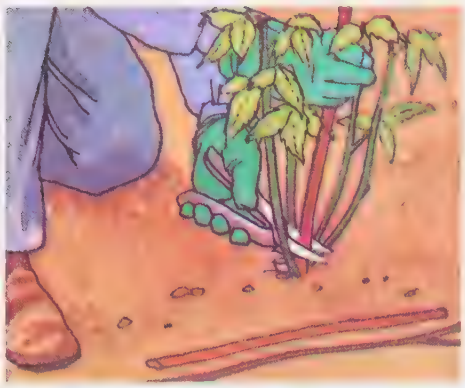


To support raspberries without tying individual canes, erect two rows of parallel wires through which canes will grow; fix wires to crosspieces at end posts.



Alternatively, tie canes individually to parallel horizontal wires as they grow. Erect wires at 18 in (45 cm), 3 ft (90 cm) and 4–5 ft (1.2–1.5 m) from ground.

CARE AND CULTIVATION



1. In the first summer after planting, when the young canes are 10 in (25 cm) high, cut out old canes entirely.

2. As the canes grow, tie them to bottom wire with soft twine, and then to middle and upper wires.

canes to send out more fruiting laterals, thus increasing crop yields.

Healthy raspberry plants will normally produce more canes than are practical for good cultivation, so from the second summer onward, allow only six fruiting canes per plant, choosing the strongest. If you remove all the weak, damaged or diseased canes early in the season, the selected fruiting canes will have more room to grow and more sunlight. Tie these six to the wires to keep them separated and firm. While these are flowering and fruiting, new shoots will appear and, as before, the obvious weak ones are cut out and the best of the remainder left as replacements to bear the following year's fruit.

After spring/summer cropping, cut to the ground the old fruiting canes; it is a good idea to remove and burn them immediately, to lessen the possibility of disease. Then tie in the selected young canes which have grown during the spring and summer for next year.

Everbearing (autumn-fruiting) varieties are also pruned by cutting the old canes down to ground level; the plant will then produce canes in spring and summer on which fruit will be produced in autumn and some the following spring or summer. The new canes are tied to support wires as they grow tall enough.

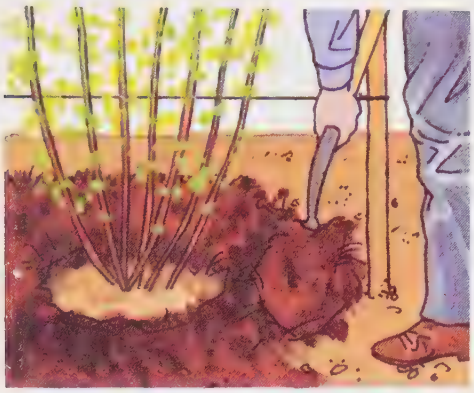
Care and cultivation

If dry weather occurs when the plants are flowering, watering is essential. Otherwise the new canes, which are growing at the same time, will be small and sparse and next year's crop will be poor. An annual mulch of well-rotted compost or manure in midspring will help conserve soil moisture. If the soil is dry, water it thoroughly before mulching. Because the roots are shallow and widespreading, the mulch should be spread 1 yd (1 m) on either side of the row. A good rule of thumb is to apply 5 lb (2.3 kg) of mulch per sq yd (sq m).

Weeds, which compete with the canes for moisture and nutrients, must be controlled. Overvigorous hoeing can do more harm than good, though, because the roots are very near the surface. Hand weeding is better. Remove unwanted suckers which may spring up between the rows, unless you want them for propagation; cut back small or spindly canes.

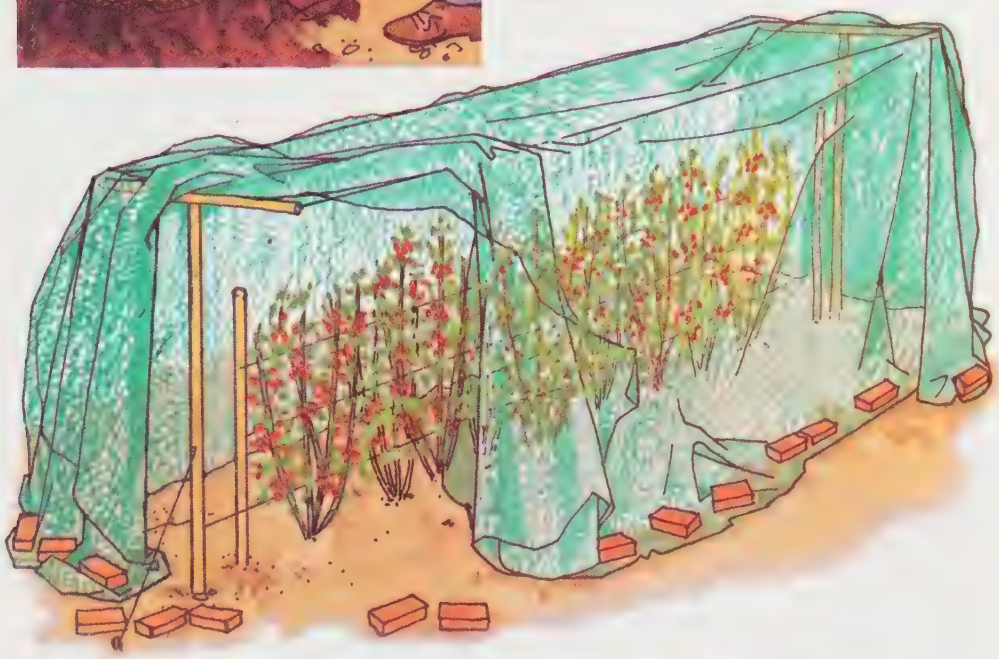
Under good conditions, red raspberries will not require extra fertilizer, but if cane production is inadequate, fertilizer should be applied in late winter. Scatter a nitrogenous one, such as sulfate of ammonia, at the rate of 1–1½ oz per sq yd (30–45 g per sq m), and one containing potassium, e.g. sulfate of potash, at ½–1 oz per sq yd (15–30 g per sq m).

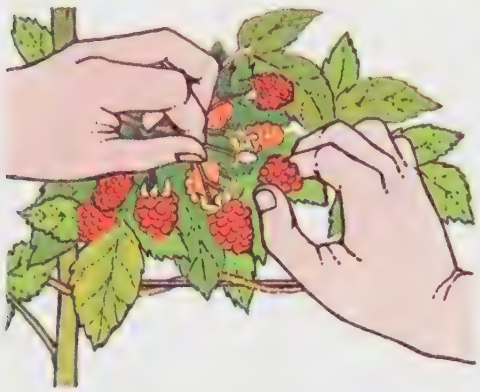
CARE AND CULTIVATION



3. Mulch in spring with garden compost or well-rotted manure to keep weeds down and conserve soil moisture.

4. If bushes are not growing in a fruit cage, give temporary protection when fruit begins to form. Use 1 in (2.5 cm) nylon mesh netting over stout wooden posts. Bricks will prevent net from blowing away in strong wind.

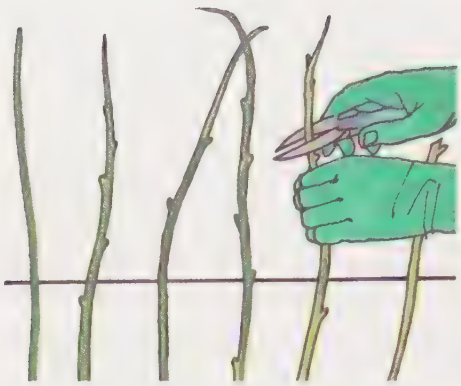




5. Harvest on dry sunny days. Support laterals with one hand while picking berries with the other.

6. Put berries in shallow bowls or small baskets so they are not crushed by their own weight.

PRUNING



1. Tip prune in winter: cut strong-growing canes back to a good bud 6 in (15 cm) above top wire.

2. After spring/summer fruiting, cut old canes back to ground level; remove and burn canes immediately.

The raspberry is a favorite target for birds, and netting is the only satisfactory long-term solution. For traditional raspberry rows, fix a T-piece to each end post so that the horizontal is about 3 ft (90 cm) wide and above the canes. Stretch two wires between the crosspieces and drop the netting over to cover the canes; 1 in (2.5 cm) nylon mesh is the best size netting.

Growing black raspberries

Newly planted canes of black raspberry varieties are best cut off at ground level after planting. Young canes produced during the first growing year are cut

A-Z Collection

A well protected raspberry crop growing in a fruit cage. Although initially expensive, fruit cages are the most effective and long-lasting method of protecting the crop from attack by birds and squirrels.

Grant Heilman

←*Black raspberries are widely grown in America. The fruit is delicious, and tastes rather like a mulberry when fully ripe.*

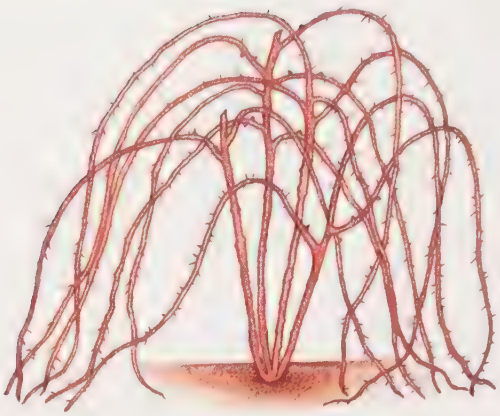
back during the summer to 20–30 in (50–75 cm) high to stimulate the growth of sideshoots. The following late winter or early spring these are also cut back to leave two to six buds, depending on the strength of the cane; the stronger shoots can support more buds. Fruiting branches are produced from these buds. It is not necessary to provide support for black raspberries, but they can be tied in for convenience. In the second and subsequent years, the primary canes should be limited to four per plant, preferably by early selection or during the postharvest cleanup. Tipping off the main shoots and cutting back of the sideshoots continues each year.

Propagation

Raspberries can be easily propagated from suckers which spring up at or near the base of the parent plant. This is a somewhat risky business, though, because if the parent plants are not absolutely healthy, the newly propagated canes will be diseased from the start. To avoid all risk, you should not propagate new canes from your own fruiting stock, but buy fresh virus-free stock from a reputable source.

If you do want to propagate new canes from your own stock, autumn is the best time to do so. With a fork, gently loosen the rooted suckers which have grown during the season and sever them from

PRUNING BLACK RASPBERRIES



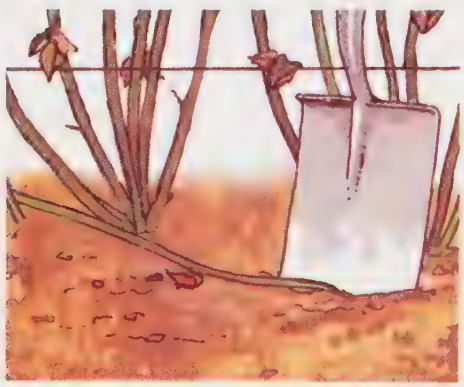
Black raspberry before spring pruning; the main canes have been stopped during the first year of growth.

To prune, cut the laterals back to two to six buds, depending on the strength of each cane.

the parent plant. The suckers should have strong, well-developed root systems: discard those without much root and those which have weak or spindly growth. Plant the suckers out in their permanent positions and immediately cut them back to 2 ft (60 cm) above ground. The following late winter or early spring, cut the canes back again, to a strong bud about 1 ft (30 cm) above ground.

The American black raspberry is propagated by tip layering. Wait until the side branches are long enough to touch the ground without snapping; this is usually in early to midsummer. Dig out a 6 in (15 cm) deep hole for each branch you are tip layering; the holes should have side slopes of about 45°. If the soil is very heavy, it is best to put a little bit of moist peat mixed with sand into the bottom of the hole; this will encourage root formation. Then gently place the tip of the branch into the hole, against the sloping side, so that about 6 in (15 cm) of cane is buried. Backfill with soil and tread down firmly. Peg the cane where it enters the soil with a metal or wooden peg, to keep it from springing up.

The following autumn, after cropping is finished, sever the rooted cane from the parent plant with a sharp spade, and transplant it to its permanent position.



The easiest way to propagate new plants is from suckers: sever them with a sharp spade, in late autumn.

Harvesting

The early fruiting varieties should be ready for harvesting early in midsummer, and should continue for a period of about three weeks. These are overlapped by the maincrop varieties, and, lastly, the autumn-fruiting types which can be picked until the first frosts of autumn. For all varieties, the harvesting procedure is the same. Pick the berries in dry weather, because raspberries will very quickly rot when picked wet. Raspber-

Donald Smith

▲ *Raspberries do not ripen all at once; inspect the canes frequently for fully ripe berries.*

ries have brittle fruiting laterals, so it is best to support the lateral with one hand while you pick the fruit off with the other.

The fruit does not ripen all at once, so inspect the canes every other day for fully ripe berries. Constant picking reduces the risk of overripe fruit going rotten and spreading disease. Normally, the fruit is picked without the central core (plug). However, if you have exceptionally large, first class berries, you can pick them with the plug and stalk intact, for serving as dessert. Cut the stalks with scissors.

When harvesting, put the fruit into shallow bowls or small baskets rather than one large basket, so the berries are not crushed by their own weight.

Raspberries do not keep for very long, so eat or preserve them quickly.

Storing

The only real way to store raspberries is to freeze them. Some varieties freeze better than others, so check with your state experiment station, extension service or agricultural college to find out the varieties in your area that are most suitable for freezing. Remember to pack materials—the fruit and the syrup, if you use one—cold. This makes the freezing process faster, which in turn helps retain better natural flavor, color and texture of your raspberries.

The raspberries you intend to freeze should be fully ripe and juicy. Wash them carefully in cold water and drain thoroughly. To avoid overhandling and so possible bruising, wash a small amount at a time—in a perforated or wire basket if you have one. You can freeze the raspberries in sugar or syrup or unsweetened. Make your choice based on how you intend to use them later on. For use as a dessert, fruit is usually packed in a syrup. For cooking, packing in dry sugar or unsweetened is best because there is less liquid. In general, berries frozen in an unsweetened pack turn out to be of lower quality than those in a sugar pack.

Exhibition tips

Exhibiting raspberries is very straightforward. Thirty is a common number of

fruits required, all of the same variety. Because they are so easily crushed, pick the fruit at the last possible moment before the show. Select about twice the number needed, so that you will have replacement fruits should you need them. Always pick raspberries for show purposes with the stalk intact. In taking them to the show, make sure the berries are not crushed by their own weight; pack them in a single layer in a box, and lightly cover with tissue paper. At the show, place them as neatly as possible on a plate.

The judges will look for large ripe fruit in good condition and free from blemish. Do not exhibit small, unripe or overripe fruit, or fruit without stalks.

Harry Smith

▲ *Sunrise*

Varieties

Single crop raspberries

Boyne: a new giant red from Canada; hardy, top quality and large-fruited.

Canby: a good early from Oregon; large-fruited, small-cored. Vigorous and thornless; midseason.

Golden Queen: attractive dessert berry; sweet, flavorful. Hardy, vigorous and midseason.

Hilton: compact plant with large berries; very productive. High quality, midseason; does not need support.

Newburgh: midseason; berries firm, small-cupped. Prolific, hardy, resists disease.

Sunrise: fruit smallish but very early, bright red, round and juicy. Hardy, disease-resistant.

Taylor: heavy producer of large firm berries. Fruits conical, well flavored; late.

Willamette: big producer of large firm fruits; medium acid, can and freeze well. Midseason, from Pacific Northwest.

Donald Smith

▲ *Canby*

Everbearing raspberries

Augustred: very early, fall crop starts early August; berries of good size, flavor. Cut to ground after fall harvest.

Durham: good producer of early summer crop on old canes where conditions are favorable. Suitable for short-season locations in the North.

Fallgold: very sweet and tasty; bears continuously July to frost. Extra hardy; plant spring or fall in North.

Harry Smith

▲ *Taylor*

Donald Smith

▲ *Augustred*

Harry Smith

▲ *Fallred*

Brian Furner

▲ *Durham*

Fallred: super hardy, vigorous. Early crop July, fall crop mid-August to frost; from New Hampshire.

Heritage: vigorous, upright, needs no staking. Very hardy; superior quality. Fall crop begins September. Red berries. Best for growing in North Central and Northeastern states.

Southland: especially suited to upper and mid South; vigorous, disease-resistant, productive.

Black raspberries

Allen: very sweet, plant vigorous; disease-resistant and hardy. Fruit firm, juicy, high quality; early July in North.

Black Hawk: early, productive even in dry weather. Keeps flavor well in freezing; especially suited to Midwest.

Bristol: hardy, heavy bearer of large berries; small seeds, high quality. Widely adapted, disease-resistant. Ready for midseason harvesting.

Jewel: firm glossy berries in large compact clusters; juicy and sweet. New York State Experiment Station.

John Robertson: very hardy, even in North; fruit large, plump, juicy, plentiful throughout the season.

Morrison: large fruits, midseason to late. Rapid grower, heavy bearer; resists disease.

Purple raspberries
Clyde: large, vigorous plants; hardy, relatively disease-free. Fruit large, glossy, juicy. Late.

Sodus: plants vigorous; fruits purple-red. Bear over several weeks in July; eat fresh, in jams, frozen.

Varieties abroad
Glen Cova: medium-sized berry; excellent for canning or freezing.

Malling Jewel: medium-sized dark red fruit, somewhat hidden by leaves curling over it; flavor excellent; most popular raspberry for general use. Less liable to wind damage.

Malling Orion: fruit medium large and round; flavor good; fruit excellent for freezing.

Phyllis King: old variety reintroduced; berries large, firm and well flavored.

Malling "M": mid to late variety with fruit excellent for canning.

Golden Everest: yellow-fruited variety with mild, delicious flavor; fruits over long season on old and young canes.

Norfolk Giant: fruit of good flavor and texture, but a bit acid for dessert; tall-growing variety, particularly good for jam-making, canning and freezing.

Zeva: Swiss variety with unusually large fruit; yields well in the first year of cropping.

Ministry of Agriculture, Fisheries & Food

▲ *A fungal infection which damages canes and causes spotted, misshapen fruit.*

Pests & Diseases

Raspberry cane borer: the tips of the canes wilt during the growing season caused by eggs laid in the shoots. Simply cut them off below the injury. Burn damaged parts. If infestation is serious, spray with malathion or Sevin just before the blooms open.

Red-necked cane borer: cigar-shaped galls appear near the bases of the canes. Cut out and burn these galls. If the infestation is serious, spray thoroughly with malathion or Sevin just before the blooms open.

Crown borer: This can be serious, especially since the damage is invisible except for poor growth and production. Pull up a cane in late summer and split it—a 1 in (2.5 cm) larva is found inside just above the soil level. Spray the cane bases with malathion or Sevin several times in late summer and early fall. (Crown borer rarely attacks black raspberries.)

Fruitworms: small larvae burrow through the receptacles or into the fruits. Spray with malathion or Sevin when most of the blossoms have fallen and repeat twice at seven-day intervals.

▲ *Spur blight attacks buds on young canes; the infection spreads back to the stem.*

Japanese beetles, leaf rollers, green worms, etc.: occasionally these cause some trouble. Spray when discovered with malathion or Sevin.

Red spider mites: leaves turn pale and dull in hot, dry weather. The tiny pest may be seen on the undersides with a magnifying glass. Wash off with a hard stream of water or spray with an approved miticide.

Anthracnose: roundish grayish-white spots appear near the bases of the canes or on fruiting spurs, practically girdling them and causing serious weakening or death. Spots may also appear on leaves and fruits. It is worse on black varieties. Fungus spores are spread by rain, etc., especially attacking shoots that are young and tender. Keep black and red raspberries well separated. Spray with a permitted fungicide just before and after blooming.

Root rot: plants turn yellow and die for no apparent reason except that the roots are dead. This is usually caused by poorly drained soils. Correct the cause.

Crown gall: rough warty growths, sometimes as large as eggs, appear at the bases of the canes. Growth may be little to greatly affected. A bacterial disease, it has no known cure as yet. Destroy the plants and do not replant for several years.

Verticillium wilt: vigorous young plants suddenly wilt and die, usually during midsummer. A bluish stripe often extends upward from the base of infected areas. This is a fungus disease which may also infect strawberries as well as tomatoes, peppers, eggplants and potatoes. Destroy infected plants. Where it is prevalent, do not plant raspberries. The organism is in the soil. Therefore, spray programs are of little help. Fortunately, it is not serious in most parts of the country.

Aphids: there are several species of aphid which infest raspberries. They are present in their largest numbers in late spring and early summer, and their feeding results in the leaves curling a little, but they do not themselves do any great damage. It is their ability to spread virus diseases which is the really troublesome aspect of their infestations. If aphids appear, spray with malathion or Sevin in spring before the flowers open, and again if necessary, but not while the plants are flowering.

Birds: unfortunately, birds find ripening raspberries particularly tempting, and although scarecrows provide some measure of relief, the only really effective long term protection is growing the crop in fruit cages or protecting them with netting at harvest time.

Spur blight: this can be quite serious, as the buds from which the fruiting laterals grow can be killed. Buds on young canes become infected first, and the infection spreads back to the stem. The infected cane nearest the bud turns purple and this patch is the first visual indication that infection has occurred. Later this changes to a grayish white. Fungal fruiting bodies appear in the center of these gray areas as tiny black dots. Cut out and burn infected canes, thin the remainder out and spray with an approved fungicide.

Chlorosis: this physiological disorder is most often seen on plants which are growing in alkaline soils. Leaf tissue of affected plants will turn yellow, on the youngest leaves first if the trouble is due to a deficiency of iron, and later the older ones; eventually they turn almost white. Lack of manganese shows as a fairly regular, small yellow mottling on the older leaves. Lack of magnesium appears as purple-brown patches on the older leaves. The best preventive measure is to correct the condition of soil before planting. Plants which develop chlorosis can be treated with sequestrenes, applied according to manufacturer's instructions or fritted trace elements can be applied. Manganese and magnesium sulfate can be applied as foliar sprays. Insufficient oxygen due to poor drainage also causes chlorosis.

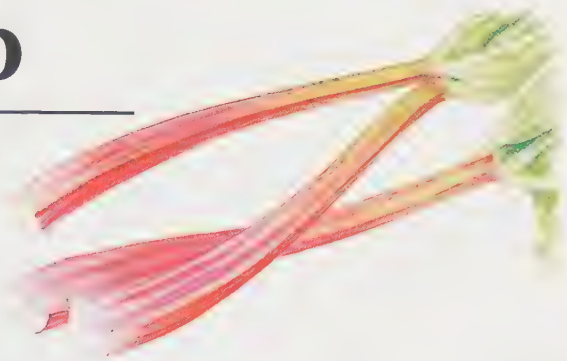
GUIDE TO RASPBERRY TROUBLES

Symptoms	*Probable cause*
Wilting tips of canes; eggs laid in shoots	Raspberry cane borer
Young shoots stunted, leaves curled	Aphids
Ripening fruit torn and holed	Birds
Cigar-shaped galls near bases of canes	Red-necked cane borer
Poor growth and production; larva inside cane just above soil level	Crown borer
Leaves skeletonized or small holes eaten in them	Japanese beetles, leaf rollers, worms
Small larvae attack fruits and destroy them	Fruitworms
Leaves become pale in hot, dry weather	Red spider mites
Gray-white spots near bases of canes, seriously weakening them	Anthracnose
Plants turn yellow and die, roots are dead	Root rot
Rough warty growths at bases of canes; growth affected	Crown gall
Vigorous young plants suddenly wilt, die; bluish stripe may extend up from base of infected areas	Verticillium wilt
Canes purple in patches around spurs, later become pale and covered with black fruiting bodies	Spur blight
Leaves yellow between veins; fall prematurely	Chlorosis
Leaves mottled or spotted yellow; leaves and canes dwarfed or stunted; diminished fruit production	Virus infections

Viruses: there are several types of viral infections to which raspberries are susceptible; this is further complicated by the fact that the same virus may have different symptoms on different varieties. All virus infections are very serious, and the infected plants must be dug up and burned as soon as the diagnosis is made. The most common virus is mosaic, which initially appears as yellow and pale green mottling or spots on the leaves. Eventually, the leaves become smaller, crumpled and distorted, the canes become stunted, cropping diminishes considerably and the plants do not respond properly to feeding with nitrogen. The plant does not necessarily die at once, but it will never recover completely or crop well again. Some varieties (especially blacks) are much more vulnerable than others. Less common is raspberry yellow dwarf virus; the main symptoms are stunted canes and linear yellow patterns on the leaves. Leaf curl causes leaflets to curl down at edges and become crinkled as well as crowded together on stunted shoots. Stunt and dwarf virus may cause trouble; infected plants may be only 2 ft (60 cm) tall and cropping nearly nonexistent. This virus is spread by leaf hoppers, unlike most other viruses, which are carried by aphids. Destroy all infected plants.

With all viruses, the best preventive measure is to control the carriers of the disease: aphids and, very rarely, leaf hoppers. Buying virus-free stock for planting is important.

Rhubarb



Rheum rhaponticum
(fam. *Polygonaceae*)
Hardy perennial with a useful life of up to 20 years
Planting to harvesting time: plants grown from crowns: 18 months; seed-grown plants: 2½ years
Size: 2 ft (60 cm) high, 3 ft (90 cm) wide
Yield: 6 lb (2.8 kg) per plant per year

The red or green stalks of rhubarb are a welcome treat in early spring, well before there is any fruit in the garden and while fruit in the stores is still expensive. The season for rhubarb is a long one, from midspring until late summer. By lifting some plants and putting them in a frame or greenhouse in late autumn, you can begin pulling stems in midwinter, giving a total cropping season of eight or nine months.

Originally a native of Siberia, rhubarb is a hardy, frost-resistant, long lived plant. Because it will survive in poor conditions, it is often treated as the "poor relation" of the garden, left to grow without proper care in a weedy overgrown patch of ground; as soon as a few stems appear it is picked to bits. Although it will survive such treatment, rhubarb grown in this way will not crop well. Select the site for planting with care, thoroughly prepare the ground and cultivate the plant properly; in return, you will enjoy years of good harvests.

Never eat the poisonous leaves, as the oxalic acid they contain can be fatal.

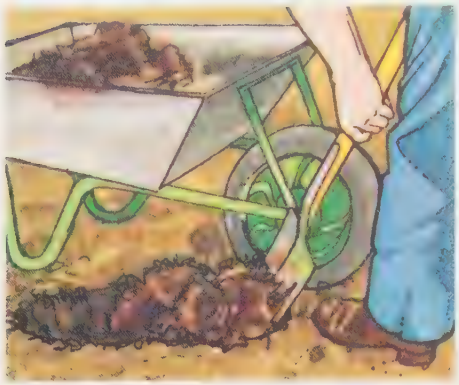
Selecting a site

Choose a sunny site, sheltered from north and east winds, and one where the plants can remain undisturbed for several years. Avoid low-lying ground liable to hold frost. Rhubarb will not crop early on a frosty site and late frosts will turn the leaves brown and rot the stems. Because rhubarb is a greedy feeder, do not site it too near trees or bushes where it will be competing for food and moisture. Nor should you plant it near fruit trees, because some chemical sprays you use on them may have a harmful effect on the rhubarb. Although rhubarb will grow in any ordinary garden soil, it prefers a slightly acid, deep rich loam that has been deeply prepared and well manured. Preparing the beds is a lot of work, but the mature plants will produce for many years with a minimum of care.

Preparing the soil

Because rhubarb likes to remain undisturbed, it is essential to dig in enough organic matter to last for several years; skimping will mean a reduced crop

GROWING RHUBARB FROM CROWNS



1. Rhubarb needs plenty of organic matter, so work in well-rotted manure prior to planting.

2. Two weeks before planting, scatter a complete fertilizer over the entire rhubarb site.

3. To obtain crowns for planting, dig up and divide crowns from healthy established plants, or buy crowns.

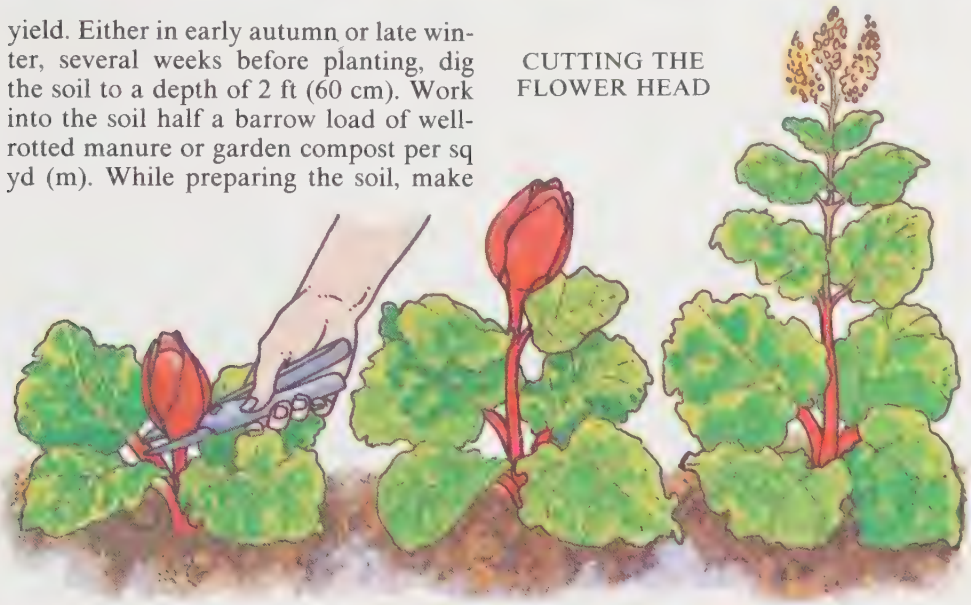
4. Plant the rhubarb crowns in the prepared soil. Cover the crowns well, with buds at soil level.

5. Pull up the soil over the buds and firm it down with your feet. Water if necessary and spread a compost over the bed.

▲ *The crown bud of a healthy young rhubarb plant just showing above the ground.*

yield. Either in early autumn or late winter, several weeks before planting, dig the soil to a depth of 2 ft (60 cm). Work into the soil half a barrow load of well-rotted manure or garden compost per sq yd (m). While preparing the soil, make

CUTTING THE FLOWER HEAD



Cut the flower head when it is still immature.

Never allow the flower head to reach this stage.

Plants allowed to flower will be temporarily weakened.

sure you remove the roots of any weeds infesting the site. Pay particular attention to perennial weeds such as thistle, nettles and couch grass. If you fail to get rid of them before the rhubarb is planted, you will not be able to once the rhubarb is in.

Two weeks before planting, scatter a general purpose complete fertilizer over the surface at a rate of 3 oz per sq yd (90 g per sq m).

Planting out crowns

The time to plant out crowns is late autumn or early spring. You can buy one year old crowns of named varieties from a garden center or nursery, or, if you are already growing rhubarb, lift and divide established crowns for replanting. If plants are cropping well, six crowns should more than fill the needs of most families. Most varieties, such as some current favorites—MacDonald, Chipman's Canada Red and West Coast's Cherry—need plenty of space to produce good crops. So set them at least 3–4 ft (90–120 cm) apart even in small gardens. Make sure the holes you dig are large enough to take the roots comfortably, otherwise growth may be stunted. Plant the crowns firmly, either in early spring or late autumn, with the topmost bud above the surface of the soil. Firm the soil around the plants and water them if the soil is on the dry side. Then spread a layer of garden compost or well-rotted manure over the bed.

If you have established rhubarb crowns in your garden which you want to divide and replant, do this in early spring or late autumn. Choose crowns that are five years old or older, making sure that they are healthy and pest- and disease-free. After lifting them from the soil, cut the rootstocks into several pieces using a sharp spade, saw or axe. Make sure that there are at least two pink growing buds on the young roots intended for planting. Throw away the old central portion and plant out the young roots immediately, following the directions for bought crowns.

Growing from seed

Another way to grow rhubarb is from seed. It is a less expensive method, but has other drawbacks. The plants grown from seed tend to be variable, sometimes producing inferior strains. Also, it takes an extra year before rhubarb from seed can be harvested, and seed is scarce.

If you are growing rhubarb from seed, sow in midspring in drills 1 in (2.5 cm) deep and 6 in (15 cm) apart, in a cold frame. You can sow them a month earlier, in early spring, in a heated greenhouse. When the seedlings have four leaves transplant into 4 in (10 cm) pots for greenhouse sown seeds, or into a prepared bed in a frame or in the open

Pull a few stems in the second spring. Grip the stem, and twist and pull simultaneously to lift.

In the following autumn, mulch the rhubarb bed with well-rotted manure or garden compost.

GROWING FROM SEED

1. Prepare a cold frame by digging in a good quality seed mixture. Rake over the bed to a fine tilth.

2. Sow the seed in midspring, in drills about 1 in (2.5 cm) deep and 6 in (15 cm) apart. Water well.

3. In late spring, plant out the young plants, spacing them about 6 in (15 cm) apart. Do not cover.

ground with protective covers, placing the young plants 6 in (15 cm) apart. In late spring put the young plants outdoors without protection. The following spring throw away the weaker plants and transfer the best young crowns to their permanent bed.

Care and development

In temperate regions, rhubarb requires little extra watering, but do not allow the soil to become dry during the summer months. If any flowering shoots appear in late spring, remove them before the buds open, otherwise the plants exhaust themselves. Unfortunately, one's own seedlings are particularly prone to producing these seed heads. If you are growing seedlings, check your plants carefully in late spring. Hoe regularly around the stems of new plants; as the plants develop, their spreading leaves should keep down most of the weeds.

Once the plants are established, give an annual top dressing of general purpose fertilizer in early spring. In the growing season, top-dress with nitrogenous fertilizer, about 3 oz per sq yd (90 g per sq m). Every autumn, mulch the crowns with a layer of well-rotted manure or garden compost to give the plants a continuing supply of nourishment and also keep weeds down.

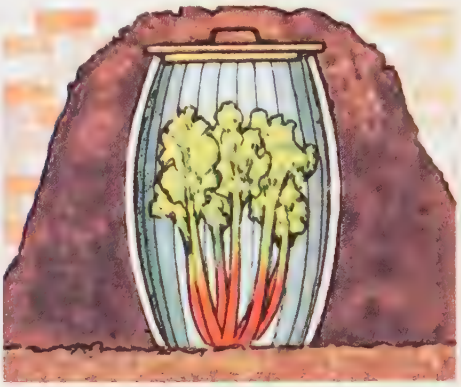
Outdoor forcing

Forced rhubarb is useful early in the season, when fruit is scarce. By forcing outdoors, pulling dates can be advanced by five weeks. After strongly established plants have been exposed to the first frosts of winter, cover them up completely. You can use earthenware pots, wood or plastic tubs, old barrels, boxes, buckets, or oil drums. The containers should be 2 ft (60 cm) tall, and preferably arranged so you can inspect the crop occasionally, and be completely clean. The containers must have no trace of oil or creosote, which would slow down the rhubarb's growth.

Once you have covered the plants with containers, heap up manure, garden compost, leaf litter, or straw around and

FORCING OUTDOORS

1. After the plants have been exposed to frost, cover them with a barrel and pile manure on top.



2. Forced rhubarb can be ready for picking in as little as three months, often when other fruit is not ready.

over the containers. This practice encourages early growth by protecting the plants from wind and cold; excluding light makes the growth tender and pale and improves its eating quality.

In midspring, when the weather warms up, remove the coverings from the plants. You can leave the manure or compost on the beds as a useful mulch.

Indoor forcing

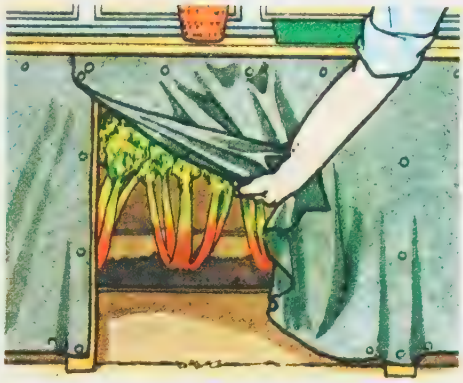
If rhubarb is brought indoors in autumn, and forced in a warm, dark place, the first stalks can be pulled in midwinter.

Tender stalks of forced rhubarb ready to be cut and cooked.

A-Z Collection

FORCING INDOORS

Lift the crowns in late autumn, and leave them on the ground for a few days to expose them to frost.



They will grow well if placed under the benches of a heated greenhouse and draped with black plastic.

Three-year-old roots are best for indoor forcing. Dig up the crowns in late autumn and leave them on the top of the soil for a few days, to expose them to wind and frost. They will then grow more quickly when placed in a warm atmosphere.

After exposure, bring them into the greenhouse. You can also use a shed or cellar, if you can provide a steady temperature of 50°–55°F (10°–13°C). Pack the roots closely together in large boxes or pots, filling the spaces between the roots with soil, damp moss, or peat. Alternatively, plant them close together in the soil under the greenhouse benches, leaving the top of the crown above the soil.

Whichever method you use, keep the soil moist by weekly watering. Use a watering can with a fine rose, being careful not to drench the plants. Keep out light by draping the boxes or benches with black plastic sheets; make sure no light is getting in through the sides of the sheeting through holes or tears. You can also use big boxes, placed upside down over the plants, to exclude light.

Screen the plants from direct heat, such as hot greenhouse pipes, with a board. A steady temperature of 40°–50°F (4°–10°C) is needed until growth is well under way. Then raise the temperature to 60°–65°F (16°–18°C) but no higher. If you raise the temperature too soon, before the growing stems are visible, the crowns may decay. The attractive pale red stalks should be ready for pulling four to six weeks after the crowns have been brought indoors. The best way to have a continuous supply of stems, and avoid a sudden glut, is to bring in a couple of crowns at a time. Start in late autumn, lifting the crowns at biweekly intervals, and continue through midwinter. Your indoor supply will then last until the first outdoor stalks are ready for pulling in midspring.

A crown which has been forced will be completely worn out by the end of the forcing season. It will never crop well again, so throw it away and lift fresh crowns for next year's forcing.

Harvesting and aftercare

Never pull any stems during the first season's growth after planting. It is best to leave plants grown from seed and young crowns divided from old rootstocks for two growing seasons without cropping. This gives the plants time to settle in and develop strong root systems. The first season you pull stalks from a plant, crop lightly or you will permanently weaken the plant.

Once the plants have been fully estab-

lished, take three or four stems at a time from a crown. Do not cut the stem; pull it off by gripping the leaf stalk as low as possible and then twist and pull it simultaneously. The stalk should come away without its basal bud. Only pick stems whose leaves have fully unfolded; always leave at least three or four stems on the

A clump of fine rhubarb stalks like this takes three years to grow.

Clay Perry Marshall Cavendish ©

plant. Once you have begun pulling stalks, stop harvesting after three months. This gives the plant a chance to recover from cropping and build up strength for the next year.

In midautumn, clear up the old brown leaves and top-dress the plants with a layer of rotted manure or garden compost, making sure that the crowns are well covered.

When the quality of the stalks begins to deteriorate, or if you want to replace crowns used for forcing, lift and divide the plants. Normally this is done every five to eight years, but a well-tended rhubarb bed, if it is not overpicked, will give good crops for ten or twenty years. The tart stems are used on their own or with other fruits, such as apples, gooseberries, or strawberries, in pies and preserves, stewed with sugar, or made into wine.

Exhibition tips

There are two categories for exhibiting rhubarb: forced and natural. In both categories the judges will look at the condition of the stalks, the color, thickness and straightness, and the uniformity of the stalks exhibited.

Usually, forced rhubarb is ready for picking too early in the year, well before summer shows. If you are exhibiting forced rhubarb, be careful when you pick the stalks, as they bruise easily. The required number of stalks should be put in a bundle and tied at both ends for showing.

Although natural rhubarb is at its best in early or midspring, straight, long stalks with well developed red coloring can usually be picked from strong growing clumps for midsummer shows. Gather the stalks the day before the show. Usually, three or six stalks are shown. Cut off the foliage, leaving 2 in (5 cm) of leaf, and wipe the stalks with a damp cloth. Trim any rough bits at the bottom of the stalk with scissors, then wrap the stalks individually in damp cloth until the show. As with forced rhubarb, exhibit the stalks in a bundle, tied together at both ends.

Varieties

Cherry: an old reliable, heavy and consistent yielder on the Pacific Coast.
Chipman's Canada Red: Tender, sweet and red throughout stalks; keeps color cooked, canned and frozen.
Flare: very tasty, a good producer; stems green shading to red.
MacDonald: tall, brilliant red and very hardy; also tender and well-flavored. Strongly seeding-resistant.
Valentine: less acid then most and produces a highly colored sauce. Vigorous; bears a year earlier than others.
Victoria (Crimson King): popular, with red-shaded stalks; heavy yielder. Does well everywhere; comes true from seed.

Harry Smith

▲ *Forced stalks.*

Mark Lawrence Marshall Cavendish ©

▲ *Natural rhubarb, unforced.*

Pests & Diseases

Rhubarb is generally pest- and disease-free; the most serious infection, and the most liable to occur, is crown rot. If you keep the garden weed-free and rotate crops, it is unlikely your rhubarb will be infected with any of the others.

Crown rot: this disease is carried by bacteria, and enters the plant through wounds. The terminal bud rots away, followed by a brownish rotting of the pithy tissues beneath the bud. If the rhubarb is badly infected, a black cavity is formed in the crown, and the top of the plant can be knocked or broken off easily. If any sideshoots develop, they look spindly, with weak stems and dull, gray-green leaves. There is no cure for this disease, and any infected plant should be dug up and burned.

Leaf spot: this disease is caused by a fungus which disfigures the leaves. Irregular brown spots, sometimes very numerous, appear on the foliage of infected plants. Usually only weak plants are attacked; proper feeding and cultivation is the best method of preventing leaf spot. If your plants are infected, spray with a fungicide approved by your own state authorities, after removing the infected leaves. Spray again two weeks later.

Mosaic virus: leaves attacked by this virus become mottled, with yellow or pale green spots appearing on the darker green background of the leaf. Infected leaves are smaller and have weak, spindly stalks. There is no control for mosaic virus; destroy infected plants.

National Vegetable Research Station

▲ *Symptoms of the fungus disease leaf spot: numerous irregular brown spots on foliage.*

Botrytis: gray mold fungus rarely infects rhubarb outdoors, except in very wet seasons. Forced rhubarb is more likely to be attacked. The fungus is spread by contact with infected plants, or through wounds, dead or decaying tissue: it appears as a fluffy, gray growth on the leaves or stems. There is no effective control; destroy infected plants.

Honey fungus: this infection is most likely to occur on heavy, badly drained soil. As with leaf spot, weak plants are particularly vulnerable. Only the roots are affected; plants which die for no apparent reason should be dug up and inspected. Infected roots will have long black strands like shoelaces coming out of them into the soil. There is no control for honey fungus; dig out and burn any infected plants. Make sure that no bits of the infected roots have been left in the ground, or the infection may spread to other plants. Dig out the infected soil and replace with fresh earth. If you replace the diseased plants with new stock, site them in a different area.

GUIDE TO RHUBARB TROUBLES

Symptom	*Probable cause*
Terminal buds rot away, followed by black cavities in the crown	Crown rot
Fluffy gray growths on stem or leaves	Botrytis
Brown spots on leaves	Leaf spot
Yellow or pale green mottling of leaves, stunted growth	Mosaic virus
White streaky growths in roots	Honey fungus

step-by-step growing guide

Rutabagas

Brassica napus napobrassica (fam. *Cruciferae*)
Hardy biennial
Sowing to harvesting time: 13–15 weeks
Size: 3–7 in (7.5–17.5 cm) in diameter, 5–7 in (12.5–17.5 cm) long
Yield: 1–2¼ lb (0.5–1 kg) per root

Rutabaga (Swedish turnip, swede) is one of the hardiest vegetables, and one of the attractions of growing the crop is its ability to do well without much attention. It is primarily a cool-weather vegetable, and in fact it can be left in the soil right through the winter and will be wholesome and edible after being frozen solid for weeks.

This cousin of the true turnip originally came from Sweden—hence the name Swedish turnip and its abbreviation "swede" (as it is called in Britain).

The crop is grown for its large, yellow-fleshed roots. Rutabagas are hardier, sweeter and milder than turnips, and rarely get woody. The main harvesting difference between them and turnips is that rutabagas are used mainly in winter, while turnips are harvested in summer and autumn. The growing season of the rutabaga is much longer than the turnip's; growing a combination of the two vegetables will give you a long season of use.

Although this crop is grown mainly for its edible roots, rutabagas left in the ground will produce pale green leaves in spring which can be cooked as greens.

Rutabagas are divided into three groups according to the color of the upper part of the root: the Purple-tops, the Bronze-tops and the Green-tops. The green varieties are slower to mature than the purple sorts, which are much freer growing and the heaviest croppers. The bronze varieties are intermediate in habit between the two other types. While all the varieties are found in gardens abroad, Purple-tops are almost the only type grown in the United States.

Soil preparation

Rutabagas grow best on fertile medium loam, although with proper soil preparation they will grow well on a wide variety of soils, from light, sandy loams to medium clay.

Rutabagas, like other members of the brassica family, are subject to club root

Harry Smith

➤*Rutabagas have long, ridged necks, and mild, orange-yellow flesh. They are hardier than turnips and often can remain in the soil right through the winter.*

disease. Club root thrives in acid soil, so make sure your soil is between pH 7.0 and 7.3. If the soil is less than 7.0, apply a scattering of ground limestone as far ahead of planting time as possible to reduce acidity.

Provided the soil was well-manured for the previous crop, there should be sufficient organic matter for the rutabaga crop. If the soil was not previously manured, dig in well-rotted manure or compost at the rate of one barrowload to 12 sq yd (10 sq m). Do not apply fresh manure or compost, or watery misshapen roots may result.

The amount of fertilizer applied depends on the nature of the soil, but a good basic feeding is 3 oz per sq yd (90 g per sq m) of a complete fertilizer applied about ten days before sowing and lightly forked in. On limestone soils apply an extra 2 oz per sq yd (60 g per sq m) of superphosphate. On peaty soils, or those which are acid, fork in 2 oz per sq yd (60 g per sq m) of bone meal. Apply these extra fertilizers at the same time as the complete fertilizer.

When preparing the ground, make sure you get rid of all weeds, particularly the perennial ones such as couch grass and thistles.

If you live in an area of high rainfall, it is best to grow rutabagas on ridges. Make ridges 6–8 in (15–20 cm) high, and between 24–27 in (61–69 cm) from center to center. Ridges are better drained in winter, when the ground tends to get water-logged. Fine soil will gradually fall down to the bottom of the trench between the ridges and the roots will grow through into this.

In lower rainfall areas grow rutabagas on the flat, as ridges would tend to dry out in the summer. For the same reason, do not make ridges if your soil is very sandy or free-draining.

Firm the ground before sowing. Do not attempt to firm the ground if it is too wet, or the soil will become compacted and lose its friable quality.

1. If the soil is not fertile, prepare it by digging in plenty of well-rotted manure or garden compost.

2. In wet areas, prepare rows of ridges 6–8 in (15–20 cm) high and sow seeds on ridge tops.

3. Ten days before sowing, apply a complete fertilizer at the rate of 3 oz per sq yd (90 g per sq m).

4. If soil is dry, water thoroughly just before sowing; sow seeds thinly and lightly cover with soil.

Seed sowing

The time for seed sowing varies according to local conditions. Although they can be sown in early spring, most home gardeners wait until late spring in the North. Farther south, allow 3½ months before the first frost. The temperature required for germination is over 45°F (7°C) and less than 95°F (35°C). By sowing late in the season in warmer areas, the plants will be less subject to the worst summer heat, drought and mildews. A sowing in late summer will provide greens for use the next spring.

CARE AND CULTIVATION

1. Three weeks after sowing, or when seedlings are at rough-leaf stage, thin to 6–8 in (15–20 cm) apart.

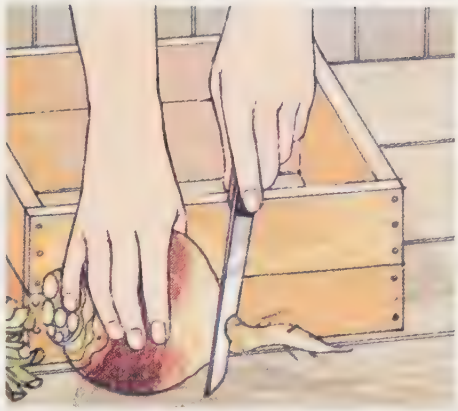
2. Keep down weeds by hoeing between rows; don't hoe too deeply. Weed by hand between plants.

3. Keep the plants well-watered until established; mulch with damp peat in very dry weather.

4. Protect the wintering rutabagas from attack by pigeons and rabbits with netting or fencing.

HARVESTING AND STORING

To harvest, gently ease rutabagas out of ground with a garden fork.



Top and tail the rutabagas before storing for future use.

If you are growing rutabagas on ridges, sow the seed as soon as possible after the ridges are prepared. If the soil is dry, water the drills right before sowing. The rows should be about 27 in (69 cm) apart; rows on the flat should be 18 in (45 cm) apart. Sow the seeds thinly, at a depth of ¾ in (1.9 cm) on light soils, or ½ in (1.3 cm) on heavier ground.

Care and cultivation

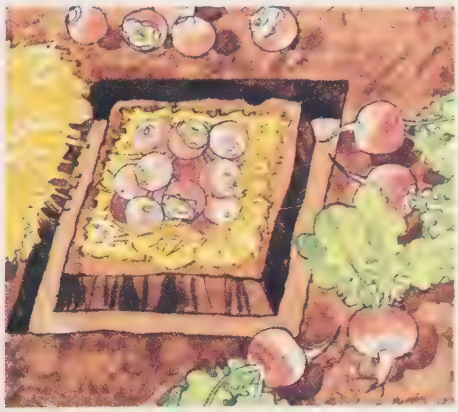
The seeds take between seven and twelve days to germinate. Thinning takes place about three weeks after sowing, when the seedlings are at the rough-leaf stage. Do not attempt to transplant the thinnings as, once disturbed, they will not grow. The final spacing of the young plants should be 10–12 in (25–30 cm) apart in the rows.

Keep the young plants well-watered until established. Cultivate the ground to kill weeds, being careful not to damage the young roots. Do not hoe too deeply; lightly loosening the soil surface will create a dust mulch which helps to conserve the moisture below. If the weather is dry, mulch with damp peat, working it up and over the tops of any protruding roots.

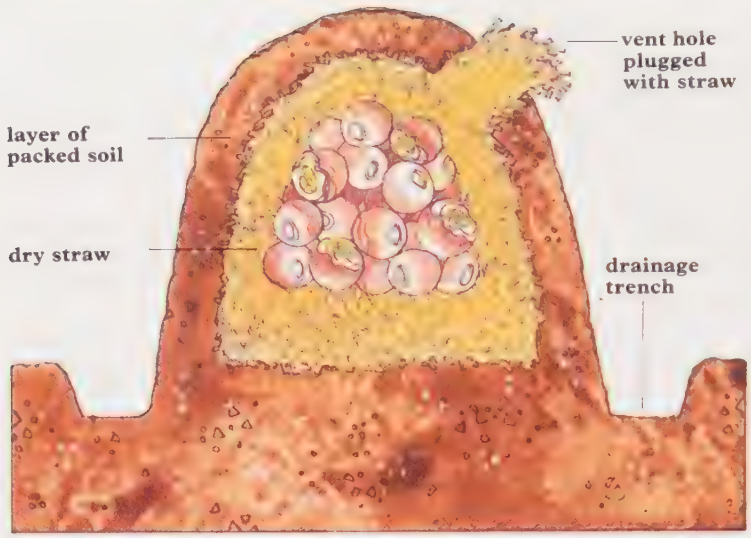
Harvesting and storing

Although rutabagas may be large enough to use in early autumn, they are often left in the ground until all the summer vegetables have been harvested and frost has set in. They can be pulled as required through the winter under a mulch or as long as the ground is soft enough to dig. A touch of frost improves the flavor of rutabagas. The wintering roots are, however, vulnerable to attack by rabbits, so make sure they are adequately protected with nets or fencing. Alternatively, you can leave them in the ground until spring, when they will produce leaves which can be cut and used as greens.

In the South, winters are rarely severe and you can usually leave the roots in



Storing in a clamp: dig drainage trench; place rutabagas on a layer of straw.



Build up heap of rutabagas. Cover them with another 4 in (10 cm) layer of straw. Put a similar depth layer of soil over the straw, leaving a vent for access and air circulation.

Remove rutabagas as you need them by unplugging the straw in the access vent and lifting the roots out. Replace the straw plug carefully.

the ground until you are ready to use them. Lift them systematically; do not pull the biggest ones first. You will then have feasible areas of cleared ground to dig over before winter sets in and any rutabagas left in the ground for spring greens will be grouped together.

An outdoor crop of spring greens is harvested by cutting off the tufts of leaves at the neck as you require them.

If you live in a cold area and have a good supply of roots and some storage space, you can lift some of the rutabagas and store them in boxes or an outdoor clamp to be sure that you will have a supply if the rest of the crop is frozen hard in the ground.

Lifting the crop can begin in late autumn. Choose a mild day and gently ease the roots out of the ground with a garden fork. If you are storing them for future use, top and tail them. Removing the leaves and root tails makes them easier to store, and helps prevent rot.

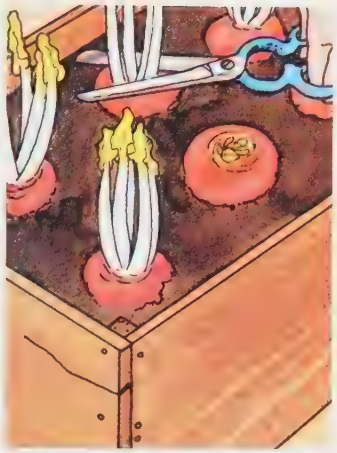
To store them indoors, pack the rutabagas in layers in a box, and cover them with fine sand. They can also be stored loose in a sack. Whichever method of in-

Step-by-step Growing Guide for Rutabagas 669

PRODUCING BLANCHED STEMS

1. Dig up rutabagas in late autumn; cut back neck and root, plant in box filled with soil or peat. Water well and store in dark place.

2. Cut blanched shoots when they are 8 in (20 cm) long.



door storing you use, make sure you keep them cool, preferably at a temperature of 32°–40°F (0°–4°C). Be on the lookout for vermin, such as mice or rats; if you see any, put down poison or set traps.

To make a clamp for outside storage in cold areas, select a plot of ground not subject to waterlogging and clear it of all rubbish. Lay a 4 in (10 cm) layer of clean dry straw on the soil and put the rutabagas on top. Cover them with another 4 in (10 cm) layer of straw. Then place a covering of soil, 3–4 in (7.5–10 cm) deep, over the straw, leaving an access vent, or more than one in larger clamps. A shallow trench around the clamp will have been formed by excavating the soil. On heavy soils water can collect in the trench, so build up a pathway at the original soil level to the clamp, to avoid having to walk through the water.

A more modern and simpler type of storage is in your freezer. For this process, rutabagas should be of medium size with no tough fibers, young and tender.

Producing blanched stems

You can induce rutabaga roots to produce blanched stems, like chicory, which are excellent in winter salads or as a cooked vegetable. Dig up medium-sized roots in late autumn or early winter, after a few winter frosts. You do not need the best roots for forcing; small or misshapen ones will do just as well. Cut off all top growth above 1 in (2.5 cm); shorten back the neck and root tail to the swollen root base. These rutabagas should be about 4 in (10 cm) in diameter, and 7 in (17.5 cm) long. Then fill boxes with friable soil or peat to a depth of 1 in (2.5 cm). Press the roots gently into the soil with a space of about 1 in (2.5 cm) between them. Continue filling the spaces between them with peat or soil until the soil is level with the neck of the roots. Water them well, and keep them in a dark place, with a temperature of 55°–60°F (13°–15°C). Cut the blanched shoots when they are about 8 in (20 cm) long.

Exhibition tips

Rutabagas for exhibition should be medium-sized, clear-skinned, solid and shapely, with small taproots. Prior to the show, lift the roots carefully, so they are not damaged. Place them on wet sacking in a cool place, and keep them covered. Wash them in cold water, sponging off any soil which is sticking to the roots. Cut off any whiskery side roots and dead outer foliage. Then cut back the remaining foliage to 4 in (10 cm) and tie with green twine. Usually three or six rutabagas are shown; these should be displayed on a plate with the roots facing frontward. They are also often used in displays of mixed vegetables.

G. E. Hyde

Varieties

Altasweet: similar to Laurentian but milder flavored; flesh deep yellow. A good table variety.

Golden Neckless: hardy, heavy, well-shaped and productive.

Purple Top Yellow: large, sweet, fine-grained; bright orange when cooked. Also good in South.

Harry Smith

Laurentian: the most popular variety in Canada and promising in the United States; roots are smooth, flesh yellow. Also stores well.

York Swede Registered: a Laurentian type; resists club root better than most.

Brian Furner

Bronze Top variety, above left; Laurentian, above right. Purple Top Yellow is at left.

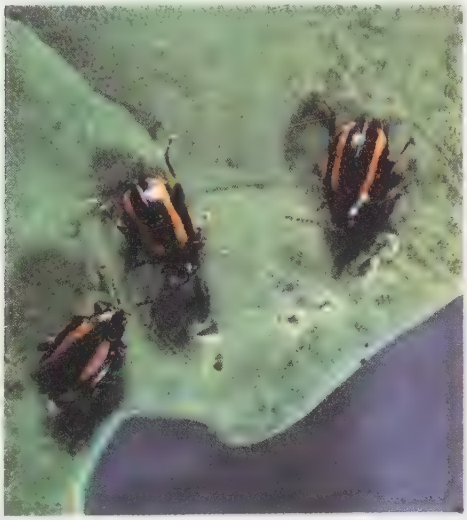
Pests & Diseases

Common sense, clean cultivation and crop rotation will do much to minimize the harmful effects of pests and diseases. The four main troubles which commonly occur in rutabaga crops are club root, aphids, maggots and various flea beetles. These will also affect other members of the brassica family; club root, which is particularly destructive, may persist in the soil for many years.

Flea beetle: these are usually most destructive at the seedling stage and occur mainly in dry weather. They eat small round holes in the leaves; in severe cases the plants may be entirely defoliated. Treat the seed before sowing, dust the seedlings when they appear, or use pyrethrum, rotenone or Sevin on the plants.

Cabbage maggot: white maggots attack the roots, causing round swellings to appear on the upper part of the roots. Control by treating the seed.

Aphids: these insects appear during hot weather. They form large colonies on the under and upper surfaces of the leaves which causes the leaves to curl; stems may also become twisted and distorted.



Murphy Chemicals Ltd.

▲ *Flea beetle damage; the beetles can defoliate young plants.*

Shell photo

▲ *Cabbage maggots occupy the cavities in the swellings on rutabaga roots.*

Ministry of Agriculture, Fisheries and Food

▲ *Club root: serious fungal disease causing swollen, foul-smelling inedible roots.*

Control them with malathion or spray with pyrethrum, rotenone or Sevin.

Club root disease: this fungus attacks not only other brassicas, but most members of the *Cruciferae* family. The symptoms of the disease are stunted and weak plants having swollen roots. The infected roots are gnarled and galled, slimy, rotten and foul-smelling. Prevention is the

best defense. Be sure that the ground is not too acid before sowing, as club root thrives in acid soils. It is prevalent on badly-drained soils; make sure drainage problems have been corrected before sowing. Do not grow rutabagas on land which has grown any of the cabbage family in the last two years. Finally, avoid using manure or compost containing infected roots or leaves.

Liming the soil will help control the disease; sprinkle lime at the rate of 28 lb to 30 sq yd (12 kg to 25 sq m).

Wireworms: these shiny yellow worms occasionally tunnel into the roots; they usually occur on ground freshly turned over after grass. An approved insecticide dust raked in before sowing will help to minimize the attacks.

Slugs and snails: these pests do twofold damage. They eat the leaves and roots, and the holes they make allow root rotting disease organisms to enter. Control slugs and snails with any proprietary bait.

Root rots: dry rot (phoma rot) occurs as brown, sunken, elongated cankerlike areas on the side of the roots. Prevention is again the main control of this problem. Eliminate slugs and snails and avoid using manure or compost containing infected roots. Use the same preventive measures against soft rot, which causes brown or gray mottling and eventual softness and sliminess of the root.

Blackleg: this causes trouble similar to damping-off with seedlings, but stem bases of older plants may be attacked; the stems may appear girdled and break off easily. It is not necessarily fatal to the crop, but infected plants will be stunted. Avoid locations that have recently grown a member of the cabbage family.

Downy mildew: this fungus infection thrives in wet weather; the first sign is grayish-white patches on the leaves, generally on the undersides, followed by wilting and yellowing. Spray the plants with an approved fungicide.

Powdery mildew: this fungus appears as whitish powdery patches on the leaves. Pick off affected leaves and spray the plants with a recommended fungicide; avoid overcrowding to prevent attacks.

GUIDE TO RUTABAGA TROUBLES

Symptoms	*Probable cause*
Curled leaves, twisted stems with colonies of green, black or bluish insects on leaves and stems	Aphids
Small round holes in leaves of seedlings or plants	Flea beetles
Swellings containing white maggots on upper part of roots	Cabbage maggot
Slime trails, holed leaves, stalks and roots	Slugs and snails
Shiny, yellow worms and tunnels in the roots	Wireworms
Weak, sickly plants with swollen, galled, bad-smelling and rotting roots	Club root disease
Brown, sunken elongated cankerlike areas on the side of the roots	Phoma rot
Gray or brown mottled areas, some being soft and slimy in the advanced stages	Soft rot
Seedling stems girdled and brittle, some falling over and dying	Blackleg

growing ideas

One of the Onion Family

Shallots are one of the most flavorful and highly prized members of the onion family, so save a spot in your onion bed to grow this delicious vegetable.

Once thought to be a separate species called *Allium ascalonicum,* shallots are actually an aberrant form of the ordinary onion. These tasty bulbs are produced in clusters, rather than a single bulb like most onions—each segment with a thin dry skin of its own. Slim tubular leaves make young shallot plants resemble a bunch of scallions. They grow to about 18 in (45 cm) tall and in early summer may produce tiny violet or white flowers. They are mainly a garden crop; commercial production is limited, making shallots hard to find and often expensive to buy. However, they are no more difficult to grow than any other type of onion, so why not give them a try? Furthermore, they are becoming increasingly popular in certain types of cookery, and you will be glad to have your own when you need them and they are not available in the supermarkets. They are also used in pickling.

Shallots do well in a good soil, but are less demanding on the whole in their requirements than onions. Avoid heavy, acid or very wet soils. Dig in some well-rotted garden compost or leafmold early in the winter before planting to improve the drainage, or grow the shallots in

Pat Brindley

➤*A fine crop of Dutch Yellow shallots. This large-bulbed variety is long-keeping, and is one of the favorite types for exhibition growing.*

ground manured for a previous crop. Like onions, shallots do best in an open, sunny site; you can put in a row or two with your main crop of onions.

In most parts of the country, it is best to plant them in early spring. If summer temperatures in your area are likely to stay over 90° F (32° C) for extended periods, plant in late summer or fall for winter-spring harvesting. Like onions, shallots are almost always grown from sets. They can be grown from seed, but this is far more difficult, and the seed is usually hard to obtain. Sets are obtainable from some seed merchants, or you can save your own from year to year. Before planting, cut off the brown, withered leaves from the tops of the sets, otherwise the birds will pull them out of the ground by these old leaves. Take out narrow drills about 15 in (38 cm) apart, and place the bulbs in them, 6-8 in (15–20 cm) apart. The tips should just protrude over the surface of the soil. Do not push the bulbs down into the soil, as this will cause the soil beneath to form a hard pan and make it difficult for the roots to extend downward.

If birds are fond of your newly planted shallot sets and pull them out of the ground, stretch enmeshments of black thread over the rows to protect them. Pea guards can also be placed over the rows. Check your sets a week or so after planting to be sure they are still firmly in the ground. Protection is not necessary after the tips of the shoots have turned green.

Some weeks after planting, the shallots will begin to produce sideshoots. Some of these can be pulled for use in salads, if you like salad onions with a very mild flavor. The rest of the shoots will grow to form bulbs about 1 in (2.5 cm) in diameter, grouped in small clusters.

Shallots require very little in the way of cultivation. Use your hoe frequently to keep the bed free of weeds, and provide enough water to keep the plants growing, especially in hot, dry weather. Be careful not to overwater, as the bulbs will not ripen or may even rot.

The bulbs should start to mature in midsummer. Scrape back the soil at this time to allow the sun to shine on the bulbs and help ripen them. When the foliage turns yellow and dies, the shallots are ready for lifting. Use a fork to lift the clusters carefully. Take care not to separate the clusters at this time, or the bulbs may soften.

Like onions, shallots must be allowed to dry before storing. If the summer is warm and dry, you can simply lay them on the ground to dry in the sun. In most years, however, you would do well to dry them on a rack, or to bring them into a cool, airy shed. Or you could cover the pulled bulbs with plastic tunnels, leaving the ends open so that the wind blows through to dry them out.

When the clusters are thoroughly dry, break them up and check each bulb individually for any signs of disease. Never store any diseased bulbs, as they will not keep well and the disease may spread to the rest of your bulbs. Place the shallot bulbs in net bags and hang them in a cool, dry place, or spread them out in a thin layer in shallow boxes, also kept in a cool, dry place. Properly stored shallots will keep for eight months to a year so you will have a year-round supply of these delicately flavored bulbs to use in special dishes.

Fortunately shallots are relatively trouble-free plants. Onion fly is the most likely problem, especially when onions are growing nearby. The fly lays its eggs in cracks in the soil surface close to the bulbs, in late spring and early summer, and the larvae burrow into and spoil the bulbs. Control by dusting the bed with Sevin in late spring. Be careful also not to buy bulbs infected with virus. Such bulbs are likely to be offered at very low prices.

If you go in for exhibition growing, you might want to try shallots. Plant only regular-sized, high-quality bulbs. Start them into growth in early winter in a cool greenhouse and feed with liquid manure during the growing period to produce show-quality, prize-winning shallots.

step-by-step growing guide

Spinach

Spinacea oleracea (fam. *Chenopodiaceae*), winter, prickly (seeded) or long-standing prickly spinach
Spinacea oleracea inermis, summer or round-seeded spinach
Tetragonia expansa (fam. *Aizoaceae*), New Zealand spinach
Hardy or **half-hardy annual**
Size: height to 8 in (20 cm); width 12–15 in (30–38 cm) for summer and winter spinach; trailing, width to 2 ft (60 cm) for New Zealand spinach
Sowing to harvesting time: 6–8 weeks
Yield: 5 oz (140 g) per plant before it bolts for summer type; 8 oz (230 g) per plant for winter type; 12 oz (340 g) per plant for New Zealand spinach

Spinach is a highly nutritious vegetable, rich in protein and vitamin A. It is quick growing and needs a minimum of care; by successional sowings and giving some winter protection, you can have good crops of spinach as far north as New York City all year round.

There is some confusion over the name "spinach" because it is used for many vegetables which are not true spinach but have leaves which are eaten like those of spinach. For example, "perpetual spinach" ("spinach beet") is a member of the beet family. Here we are dealing with the cultivation of three types: winter, summer and New Zealand.

True spinach is winter, or prickly spinach. "Prickly" refers not to the leaves, but the seed capsule. It is a spreading, branching plant, with triangular dark green leaves. At one time winter spinach was thought to be hardier than summer spinach. This has been disproved, however, and round seeded varieties can be sown right through the year.

Summer (round) spinach is a variety of winter spinach; it has round smooth seed capsules and slightly larger lighter green leaves. Summer spinach has a bad reputation for bolting, or running to seed. When this happens, the plants send up tall leafy stems with small green flowers at the top; the leaves then become bitter tasting and unpleasant to eat. Premature bolting is easily controlled, however, by making sure that you meet the basic cultivation requirements. Spinach must never run short of water, and needs some form of shade during the hottest summer months. Of equal importance is thinning the seedlings as soon as possible so they are never overcrowded. Spinach

Harry Smith Collection

▲ *Spinach is an excellent, nutritious vegetable, relatively quick and easy to grow.*

grown in crowded, starved conditions is more apt to bolt.

One sowing of summer spinach will give about three weeks picking; to get continuous supplies, you should sow at three-week intervals. Because winter spinach is less likely to bolt, two or three sowings in late summer through midautumn—where the weather is mild enough—should give supplies right through winter and into early spring.

New Zealand spinach is not a true spinach, although it tastes fairly similar. It is not as hardy as winter or summer spinach, and is most successful in hot dry summers. Because it does well in very sunny conditions and does not bolt, it can be planted where ordinary spinach would do poorly. New Zealand spinach is a vigorous spreading plant, with floppy stem and fleshy, arrow-shaped leaves up to 5 in (12.5 cm) long.

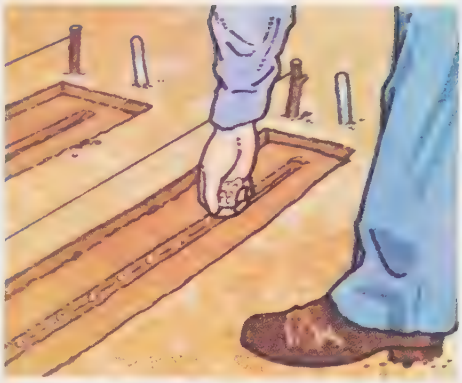
Suitable site and soil

To grow year-round supplies of spinach, you must make several successional sowings. The conditions needed for successful growing will change according to the time of year and variety of spinach grown. A sheltered site is preferred for winter spinach and early sowings of summer spinach. From late spring through midsummer, however, too much warmth and sunshine may lead to bolting, so a cool shady site is preferable. Spinach is ideal for growing in the shade of peas or climbing beans during hot summer months.

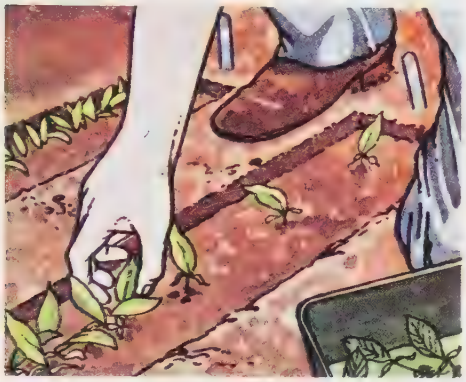
Step-by-step Growing Guide for Spinach 677

SUMMER SPINACH

1. Start sowing under protective covers in late winter; continue successional sowing until late spring.



2. For free-draining soil, make a shallow trench 1 ft (30 cm) wide, with a central drill 1 in (2.5 cm) deep.



3. Thin the seedlings when they are 1–2 in (2.5–5 cm) high, to a distance of 5–6 in (12.5–15 cm) apart.

4. Shallow hoeing keeps weeds down and also creates a dust mulch which helps conserve moisture.

New Zealand spinach needs a light, well-drained soil in a hot sunny position, and will crop well where ordinary spinach would quickly run to seed. New Zealand spinach likes soil fairly rich in lime, so it does particularly well on limestone subsoils; avoid acid soils or lime them well before growing, at a rate determined by the result of a soil test.

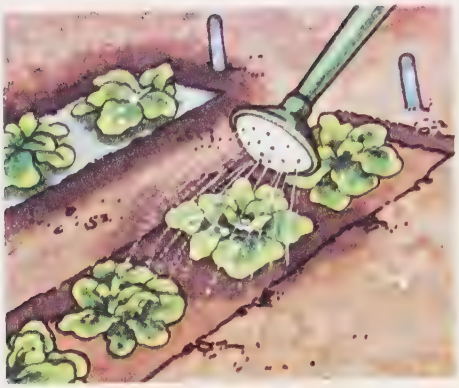
The needs of spinach vary throughout the year. Because it is such a quick grower, however, spinach is an excellent catch crop and can be grown and harvested without interfering with slower-growing crops, such as leeks or cabbages.

Spinach needs a rich moisture retentive soil, and it is a waste of time to sow on a dry, poorly worked site. The ground should be well dug over and watered, using between 12 and 22 lb per sq yd (5 and 10 kg per sq m) of rotted manure or garden compost; the high rate is best if the soil is light or sandy. At the same time a dressing of fertilizer containing 12% nitrogen and 6% each of phosphate and potassium should be worked in at the rate of 1 oz per sq yd (30 g per sq m). No further feeding should be needed.

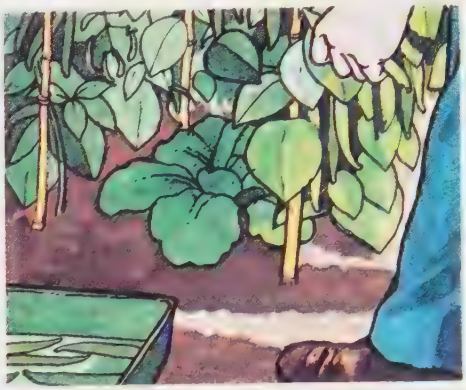
Sowing

Besides sowing frequently, you must sow spinach in large enough quantities to

SUMMER SPINACH



5. Water often in hot weather; use a fine nozzle or rose on your watering can so soil is not washed away.



6. Spinach is good for intercropping, and will grow well in the shade of climbing beans or peas.

7. When harvesting, take only a few leaves from each plant at one time; overpicking can kill the plant.

8. After the final harvest, chop up the plants and dig them into the soil to act as green manure.

provide reasonable supplies for your family. Whereas "little and often" applies to the sowing of radishes and lettuce, it does not entirely apply to spinach. A whole panful of leaves when cooked will boil down to a couple of spoonfuls; if you then overpick to get enough leaves, the plants will stop producing new leaves and may die altogether. A good rule of thumb is to allow five plants per person per sowing, or a 20 in (50 cm) row per person; 1 oz (30 g) of seed is enough to sow 12 ft (3.6 m). If you have more seed than you need, you can either share it with friends or store it; spinach seeds will keep for five years.

Make the first sowings under glass or indoors in late winter, and continue making successional sowings at the rate of one every three or four weeks until late spring in cool areas. It is best to use bolt-resistant varieties for these early sowings.

If your soil is light and very free draining, you can reduce the problem of drying out and bolting by making a shallow trench in which to sow the seeds. For each row of seeds, hollow out a trench 2 in (5 cm) deep and about 1 ft (30 cm) wide. In the middle of this trench, make a drill another 1 in (2.5 cm) deep to sow the seeds in. This shallow

trenching system will allow you to flood the trenches, with little water loss. If the soil is very dry, water it thoroughly just before sowing, or soak the seeds in water for a few hours prior to sowing. If you are sowing more than one row of spinach, make the rows at least 1½ ft (45 cm) apart. You can grow good spinach with a spacing of 1 ft (30 cm) between rows, but the extra width allows you to cultivate the plants and harvest them without trampling on the bottom leaves. For some of the larger varieties, 2 ft (60 cm) between rows would be better, and for New Zealand spinach, 3 ft (90 cm) is needed.

Germination may be sparse, so it is best to sow one seed every 3 in (7.5 cm) and thin later. The seeds are actually capsules containing two or three tiny seeds, so you may get two or three seedlings at each station. After sowing, cover the capsules with 1 in (2.5 cm) of soil, and press down firmly with the back of a rake. Germination should take place one to two weeks after sowing.

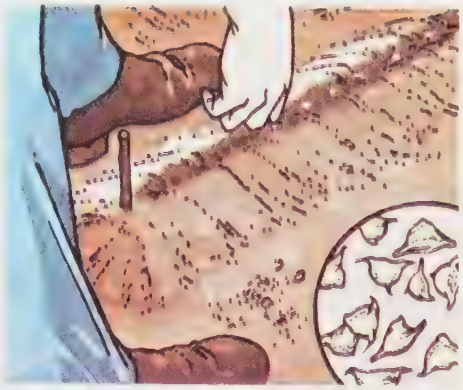
Winter spinach should be sown from late summer through to midautumn—climate permitting, at the same spacing and depth as for summer spinach. However, with winter spinach you have to avoid too much rather than too little water. If your soil is heavy, it is best to form small ridges on which to sow the seeds. Make them 3 in (7.5 cm) high, with 2 ft (60 cm) from center to center. These raised ridges will help keep the spinach dry in the winter, which is important for a good crop.

Before sowing, it is advisable to soak the seeds of New Zealand spinach for 24 hours in water to aid in germination as the seed coat is very hard. Whichever method of sowing you use, sow them in groups of threes, to allow for some failure in germination which may occur. The final spacing should be 8 in (20 cm) apart in rows 24 in (60 cm) apart.

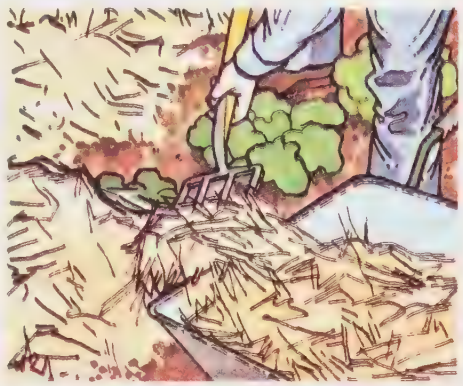
Cultivation

Thinning the young seedlings is very important; overcrowded plants are more liable to become diseased, unlikely to

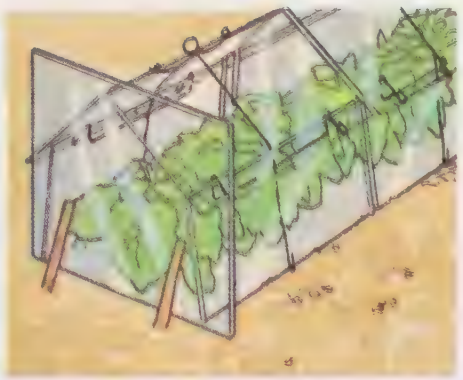
WINTER SPINACH



1. Sow from late summer through the midautumn. For heavy soils, make small ridges on which to sow seeds.



2. Protect open grown spinach from winter weather with a layer of clean straw placed between the rows.



3. Protective covers are an alternative way to protect winter spinach; they also help keep the leaves free of mud.

R. J. Corbin

▲ *New Zealand spinach is an excellent crop for hot dry sites, as it is bolt-resistant.*

develop fully, and more likely to run to seed. Thin seedlings of summer spinach when they are 1–2 in (2.5–5 cm) high, to a distance of 5–6 in (12.5–15 cm) apart. Thin again when the leaves of adjacent plants begin to touch each other to a final spacing of 9–12 in (23–30 cm) apart. If more than one seed germinates at a spot, select the strongest and thin out the rest. Winter spinach being slightly smaller should be thinned to 9 in (23 cm) apart; New Zealand spinach grows larger and needs to be spaced 2 ft (60 cm) apart between rows.

Never let the soil dry out in hot weather, otherwise summer spinach is likely to bolt. Remember, though, that spinach needs a steady, constant supply of moisture: overwatering after a long dry spell can also lead to bolting. Too much water in early fall can also lead to soft rank growth, easily frosted in the autumn. Make sure you use a fine nozzle or rose on your watering can to avoid washing any soil away.

Keep the beds weed-free, although healthy growing spinach will form a dense, impenetrable ground cover leaving little room for weeds. If weeds do appear, either hand-weed or hoe. Regular shallow hoeing also prevents the soil from caking in hot weather, and provides a dust mulch which helps conserve moisture.

Although New Zealand spinach will not bolt in hot dry weather, it needs a steady supply of water at such a time. Harvest growing tips frequently, so that the plant will produce a continuous supply of sideshoots.

In mild climates, protection is very useful if you want to continue picking through winter and get an early spring crop as well. Winter spinach sown under glass in early autumn will be ready for picking from autumn onward. Protecting with glass also helps keep the leaves free of mud. If this is not possible, it is a good idea to protect open grown spinach from late autumn onward with a layer of clean straw placed between the rows. Polyethylene tunnels are also effective with an

Step-by-step Growing Guide for Spinach 681

NEW ZEALAND SPINACH

1. New Zealand spinach thrives on limy soil; if your soil is acid, apply lime before sowing. Determine the rate by testing the soil.

2. Because the seed coat is hard, soak the seeds in water for 24 hours before sowing in soil that has good drainage.

3. Sow in pots in spring if the season is late; plant out in early summer, spacing the rows 2 ft (60 cm) apart.

4. Harvest growing tips frequently so the plants will produce a steady supply of sideshoots.

5. Picking usually starts from early summer onward, five to six weeks after sowing, and continues until the first hard frosts of autumn. Cut the fleshy shoots with pointed leaves when they are about 8 in (20 cm) long.

occasional airing on mild days, but watch for slugs.

As long as the soil is reasonably rich and has been well prepared, there is no need to apply additional fertilizers once the spinach has been planted. However, you can apply a lawn-type fertilizer in early spring, at the rate of 1 oz per sq yd (30 g per sq m) to help winter spinach make a bit more spring growth.

For all types of spinach, after you have finished harvesting, chop the plants up with a spade and dig them back into the soil; they will then be a kind of green manure and enrich the soil.

Harvesting

Winter, summer and New Zealand spinach are harvested in much the same way. The thinnings of spinach are eaten first. Pull these up whole and cut the roots off. Thinnings of summer spinach are very useful for salad, as they are tender, less bitter and less stringy than fully grown leaves. When the main plants are ready, take a few leaves from each plant. Moderate picking encourages the formation of new leaves; too much picking may kill the plant. A good rule of thumb is to take off no more than half the leaves at any one picking. Select the largest and most fully formed leaves, but do not leave them until they are old and tough.

When you are picking spinach, try to take the leaves only, leaving the stem. If they are young leaves you should be able to nip them off between your finger and thumb. Otherwise, twist the midribs and pull them off outward or cut them with scissors to avoid damaging the main stem.

Winter harvesting should start in late autumn. Do not pick the plants as hard as summer spinach. Unfortunately, the thinnings are not suitable for salads as they are stringy.

New Zealand spinach is slightly more difficult to harvest because the plants are larger and tend to sprawl all over the ground. However, if you keep removing the growing tips, the plants will produce an enormous amount of leafy growth from a small area.

Start picking the fleshy shoots with pointed leaves when they are about 8 in (20 cm) long. Picking usually starts from early summer onward, five to six weeks after sowing, and continues until the first hard frosts of autumn. If you miss one or two of the tips and the plant flowers, it may self-sow and appear again.

Exhibition tips

The main problem with exhibiting spinach is that the leaves tend to go limp as soon as they are cut, and it is difficult to stage an attractive exhibit composed of wilted leaves. To help prevent wilting, cut the leaves as close to the ground as possible the night before the show, preferably in cool weather. The number of leaves required for an exhibit is frequently 15–25. It is a good idea to pick two or three times this amount, so you can select the best. Wash the leaves under cool running water to remove any soil. Then place the stalks in a bucket or large jar of water and store in a cool place overnight. The next day, lay the selected leaves on a large plate, with all the stalks pointing toward the center, like the spokes of a bicycle wheel. Spray the leaves with cool water and cover them with a light cloth until just before judging.

Varieties

America: extra longstanding; heavy plant with savoyed, dark leaves. Good late spring and early summer crop.

Avon Hybrid: fast growing, vigorous, slow to bolt; leaves large, dark, semi-crumpled. Good raw or boiled.

Cold Resistant Savoy: for late summer and fall or wintering over for spring. Blight tolerant; very bolt-resistant.

Dixie Market: medium green, fast growing; fully savoyed. Bolts easily but mildew and blight tolerant. Fall cropper.

Early Hybrid No. 7; extra fast growing; resists blight, blue mold. Very upright, productive. Bolts; plant spring or fall.

Greenmarket: large, dark green leaves; heavy yielding; slow to bolt.

Early Smooth No. 424: dark green, upright; resists blue mold. Large leaves; good canner. Used in South.
King of Denmark: grows fast; keeps long in garden. Dark green, thick; of good quality; good freezer.
Longstanding Bloomsdale Dark Green: exceptionally dark green, very crumpled. A favorite for early spring and main crop.
Longstanding Winter (Prickly): good variety for winter use; hardy and thick-leaved.
New Zealand: soft, thick, fleshy and trailing; not a true spinach; stands hot, dry conditions better.
Melody: very prolific; leaves plain, dark oval. Upright; tolerant of mosaic, blue mold. For canning, freezing; late spring, early fall.
Nobel (Longstanding Gaudry): leaves fairly smooth, large, arrow-shaped and thick. Longstanding, cleans easily.
No. 8 Hybrid: very productive, upright. Resists mosaic, blue mold. Does well in South.
Popeye F-1: especially suited for fall and winter cropping; resists mosaic, blue mold. Upright, productive.
Smooth Pak: large, dark, smooth, thick; very quick. For fall or winter; disease-resistant. Good canner.

Brian Furner

▲ *Longstanding Winter (Prickly)*

Brian Furner

▲ *Greenmarket, an English variety.*

Harry Smith Collection

▲ *New Zealand Spinach*

Brian Furner

▲ *Longstanding Bloomsdale*

Murphy Chemical Co

These spinach leaves have been damaged by aphids, which feed on the sap.

K. A. Beckett

Mangold fly maggots damage leaves by feeding on them; leaves become blistered.

Pests & Diseases

Spinach blight: this disease is caused by the cucumber mosaic virus. It is a serious disease and any infected plants should be dug up and burned as soon as the symptoms are seen. Usually the first symptom is yellowing of the younger inner leaves, and later the older ones. The inner leaves then become puckered and/or small, the leaf margins roll up, and the leaves die. Because spinach blight can be transmitted by aphids, try to keep your garden free of these pests, and also weeds, which may be infected with the virus and infested with the aphids. As with other viral infections, there is no absolute cure; the best precaution is to cultivate the plants properly and watch for any sign of the disease.

Downy mildew: this fungal infection is most liable to occur where the spinach is grown in crowded or very wet, cool conditions. It spreads very quickly particularly in wet weather, and can rapidly ruin a crop. The symptoms are yellowish patches on the upper surfaces of the leaves and downy gray growth on the undersides. The best precaution is to avoid damp conditions and thin the young plants well. Pick off and destroy any infected leaves; if the attack is severe, spray the remainder with a state-approved fungicide.

Leaf spot: the symptoms of leaf spot are small light brown spots on the leaves, each with a darker margin. Although they are only ¼ in (6 mm) across, if the infection is bad the spots join up into large areas and destroy the entire leaf. As with many diseases, the weakest plants are the most susceptible, especially if growing in badly drained soil. Remove and burn infected leaves as soon as you see them, and spray the remainder with a state-approved fungicide. Spray again two weeks later.

Damping-off: this fungal infection causes seedlings to collapse at ground level and then die. Because it occurs most frequently in close, wet conditions, the best precaution is to sow thinly and make sure the seedlings are not overcrowded or overwatered. Treated seeds will be well protected.

Magnesium deficiency: magnesium is one of the constituents of chlorophyll. If spinach is lacking magnesium, pale areas will appear between the leaf veins. Eventually the pale areas turn brown. The deficiency is most liable to occur in very acid soils, or where an excess of potash makes magnesium unavailable to plants. A good mulch of well-rotted garden compost should help with the problem, and heavy dressings of bulky organic matter before digging will gradually eliminate it. On very acid soils, apply lime also. Alternatively, if such

manures are not available, Dolomite or magnesium limestone can be applied at about 7 oz per sq yd (200 g per sq m).

Manganese deficiency: the disease called "speckled yellows" which appears on beets is really a symptom of manganese deficiency and can also affect spinach. Affected plants have leaves with yellow blotches between the veins, and the leaves tend to curl up, the trouble being most marked in midsummer. Both very sandy and alkaline soils can be deficient in manganese. Some natural recovery can occur, but if not, foliar spraying with manganese sulfate at 2 oz in 5 gal (56 g in 23 L) water with a few drops of liquid detergent added, will help the plants considerably.

Millipedes: these pests are liable to cause problems on soils which are very damp or have a high humus content. New Zealand spinach seems to be the most vulnerable; millipedes feed on the roots of seedlings and young plants, but in general little trouble need be expected in a well-worked soil. They are difficult to control. If a severe infestation is apparent while preparing the soil for sowing, use an approved insecticide.

Slugs: if the leaves have irregularly shaped holes in them, and there are faint silvery trails nearby, then slugs are the probable cause. They feed at night, and are most active in the spring and autumn. Thorough cultivation of the soil helps keep the slug population down. You can set traps of piles of decaying vegetable matter near the spinach. Inspect the traps daily and destroy any slugs you find. If the infestation is severe, use slug baits.

Aphids: the damage caused by these insects is twofold. They feed on the sap in the leaves, which results in stunted and distorted leaf growth. They also transmit viral diseases and the honeydew they leave on the plants encourages sooty mold. Hand-pick affected leaves, as soon as seen, and spray with derris, malathion, pyrethrum or Sevin if the infestation persists.

Striped blister beetle: this half-inch black pest with a yellow border and median stripe on each wing cover ranges as far west as Arkansas and Montana. Together with the three-striped blister beetle it feeds on leaves of spinach and other vegetables. Spray with non-poisonous Sevin as needed.

Flea beetles: these tiny dark beetles, which jump like fleas when disturbed, feed on the leaves but are also controlled with Sevin.

Cutworms: attack tender young plants, cutting them off at the ground. Apply slug bait when plants appear.

GUIDE TO SPINACH TROUBLES

Symptoms	*Probable causes*
Outer leaves wilt and die; inner leaves turn yellow, curl up and die	Spinach blight
Yellow patches on upper surfaces of leaves, downy gray growth on underside	Downy mildew
Seedlings collapse and die at ground level	Damping-off
Pale areas between leaf veins	Magnesium deficiency
Yellow blotches on leaves, leaves curled	Manganese deficiency
Seedlings die (New Zealand spinach)	Millipedes
Irregularly shaped holes in leaves, faint silvery trails	Slugs
Stunted distorted leaf growth	Aphids
Leaves chewed	Blister and other beetles
Young plants cut off at ground	Cutworms
Light brown spots on leaves	Leaf spot

step-by-step growing guide

Strawberries

Hybrids of *Fragaria* (fam. *Rosaceae*), derived from *F. chiloensis* and *F. virginiana*
Hardy perennial herbaceous plant with a cropping life of at most 3 years
Size: 6–12 in (15–30 cm) spread by 6–8 in (15–20 cm) high
Planting to harvesting time: 6–10 months
Yield: from 4–16 oz (115–450 g) per plant

With its mouth-watering red berries and distinctive aroma, the strawberry is perhaps the best loved of all summer fruits. Although their cultivation requires some care, strawberries are a very rewarding crop for the amateur; they are the quickest cropping of all fruits and summer varieties may even give a harvest in their first year.

Unlike most other fruits, strawberries are produced on low-growing, herbaceous plants. The cropping life of the plants is short; strawberry beds are usually replanted with fresh stock after one to three seasons. However, most varieties readily reproduce themselves from runners; as long as your plants are healthy, you can propagate your own new stocks without any additional cost.

There are two main groups of garden strawberries, summer-fruiting varieties and everbearers. Summer fruiters are by far the most popular, although they generally crop only once in the season. A few varieties may bear a second crop in the autumn if conditions are favorable. Some of the new varieties produce exceptionally large fruit, weighing up to 3 oz (90 g) each, although many people consider the smaller berries to have a superior flavor.

Everbearing strawberries (remontants) produce fruit all summer, beginning in midsummer and continuing into autumn. Removing the first trusses of blossoms from the plants prevents overlapping with summer-fruiting varieties and insures a heavier yield from the later flushes. The berries are not as large as those of the summer fruiters, and they tend to produce fewer runners. There is one variety of everbearing strawberry which produces very long runners. It is known as the climbing strawberry. Strictly speaking it does not actually climb, but it can be trained and tied to trellises.

Although they are usually grown in beds, strawberries do very well in containers, such as barrels, window boxes or special earthenware strawberry jars. This obviously has great potential for a small garden, patio or balcony. The plants have very attractive leaves and flowers,

Harry Smith

▲ *A heavy crop of well-grown strawberries is one of the home grower's finest rewards.*

and containers filled with strawberry plants make a delightful feature.

Strawberries are susceptible to a number of serious virus diseases. However, stocks have been improved by the introduction of government certification schemes. Buy disease-free certified stock if this is available. Summer and everbearing strawberries are not propagated from seed.

Suitable site and soil

Because strawberries bloom early in the year and the flowers are carried close to the ground, they are very susceptible to spring frosts. Frostbitten flowers turn black in the center, and fail to fruit. The site must therefore be frost-free, open and raised rather than low-lying. If your garden is on a slope, try to locate the strawberry bed toward the top, rather than the bottom where frost and stagnant air would collect.

A sunny site is necessary for any successful strawberry growing, and early crops need shelter as well. If the site is too windy, pollinating insects will be less likely to visit the flowers.

PREPARATION AND PLANTING

1. Double dig the soil at least a month before planting, digging in plenty of manure or garden compost.

2. If plants are in peat pots, soak pots in water, then plant with rim of pot level with soil surface.

3. The crown of the plant must be just level with the soil. If planted too high, the roots may dry out; too deep, the crown may rot.

Wild strawberries are found in rich loamy soil; cultivated strawberries are most successful if grown in a similar soil. It should be deep, with a high content of organic matter, and well drained. It must be moisture retentive as well, because crops are very dependent on a steady supply of water during the growing season.

A slightly acid soil, with a pH of 6.5, is best; if your soil is too limy, apply moist peat, garden compost or well-rotted manure. Light loams are preferable to very heavy soils, because they warm up more quickly in spring and give earlier crops. Diseases, such as red stele, are also more likely to develop on very heavy soils.

Do not make a strawberry bed on land which is newly dug from turf. There is likely to be a very high wireworm population in such soils, and wireworms can severely damage strawberry plants.

Because strawberry beds should be rotated every two or three years, many people find it most convenient to grow them as part of the vegetable garden. Remember, though, that strawberry plants should not follow potatoes or tomatoes as they are subject to some of the same diseases.

Preparation and planting

Begin preparing the soil in early spring or midsummer, at any rate at least a

month before planting. If the site has been well prepared for previous vegetable crops, just fork it over lightly and check for weeds. Otherwise, double dig to encourage a good root run, but keep the topmost soil uppermost. Make sure you have removed all traces of perennial weeds. Besides making cultivation difficult, they harbor pests and diseases and a weedy strawberry bed will never crop well.

Dig in well-rotted manure or garden compost at the rate of half a garden barrow load per sq yd (sq m). This opens up a heavy soil and improves the moisture retaining capacity of a light one. If neither is available, work in moist peat or leafmold at the same rate and scatter and rake in an equal parts (by weight) mixture of a vegetable fertilizer, sterilized bone meal and sulfate of potash, at 6 oz per sq yd (180 g per sq m). After digging, lightly roll or tread down and rake the surface smooth.

Plant summer-fruiting strawberries in late summer, early autumn, or early spring. Plant everbearers in late autumn, only when soil conditions are first class; otherwise wait until spring. You will not lose a crop by waiting.

Plant in crumbly, friable soil; wait if excessive rain has made the bed sticky, or if the soil is dry. Planting strawberries close together increases the yield from the plot as a whole, but reduces the yield per plant. Also, the size of the individual berries is likely to be reduced. When using the hill system, leave 18 in (45 cm) between plants and 2½ ft (75 cm) between rows, with 9 in (23 cm) between plants of compact varieties. Leave slightly more space around plants you intend to use for propagation only, so the runners have room to fully develop.

It is important to plant strawberries at just the right depth. If you plant them too deeply, the crowns rot; if they are too shallow, the roots may dry out. The soil level should be midway up the crown. Make a shallow hole with a small 2 in (5 cm) mound in the center, and set the plant on top of the mound. Spread the roots out over and down the mound to their full extent. If the plants come in peat pots, do not remove them but soak the pots in water for 10 minutes, and then plant at once with the rim of the pot just level with the soil surface. Always plant firmly, then water. Preferably, plant in the evening, but if this is not possible, shade the plants temporarily from strong sunshine.

Cultivation and care outdoors

Water frequently, possibly every day in the early weeks—especially if planted in summer—until the young plants are established. Then judicious watering is called for. Thereafter, unless there is a drought, you will probably not have to water them, once they are established, until the fruits are beginning to swell. Then water once, at the rate of 4½ gal per sq yd (20 L per sq m). This should suffice, unless the weather is very dry.

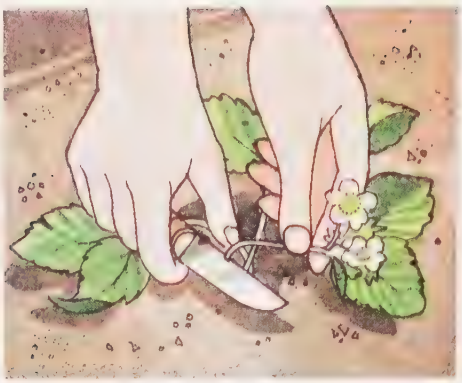
In late spring the plants will develop stolons, which are long runners with a plantlet at each joint. Cut these off at their point of origin, unless you use the matted row system.

No feeding is needed as plants come quickly into bearing, but competing weeds should be kept down by light hoeing or hand weeding. If you have cleared the ground of all perennial weeds prior to planting, the only problem will be from annual weeds. The combination of weeding and mulching should be enough; try to avoid using chemical herbicides.

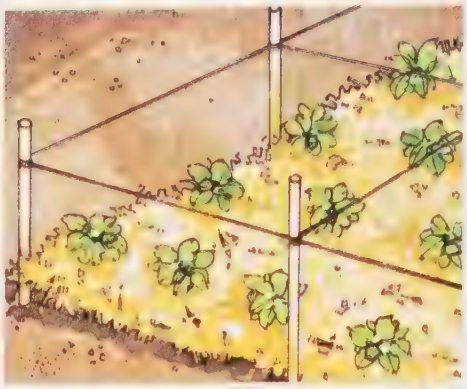
Removing all the blossom on summer fruiting varieties in their first spring gives more than two seasons' crop the following year, but few gardeners have the patience to wait that long. If planting was done after the beginning of autumn, however, it is essential to take off the first season's blossoms. Everbearing varieties should always have their early season blossoms removed to allow them to build up strength for fruiting.

Care of the fruit

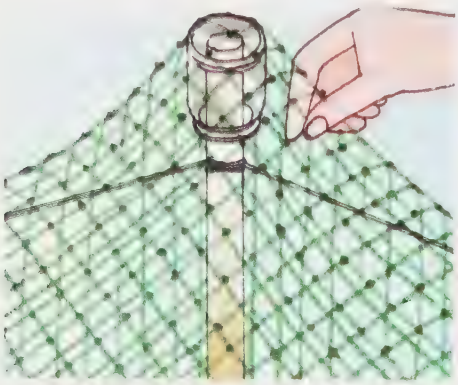
To keep the ripening fruit off the ground and free from soil splashes, strawberry



4. If planting in spring, cut off first season's blossom, so plants build up strength for future crops.



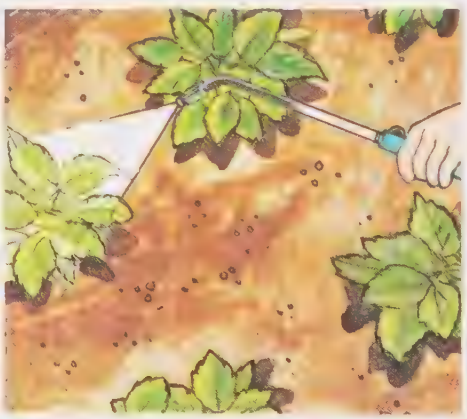
5. To protect crops from birds, make a frame for netting by stretching wires between vertical posts.



6. Invert jars over posts before putting on netting; this stops the netting from catching on the posts.

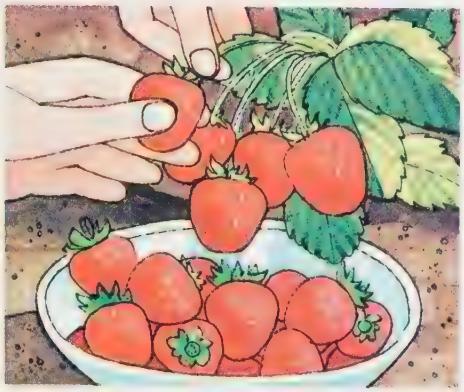
7. Water frequently and thoroughly until plants are established, particularly in hot, dry weather.

8. Hoe if necessary to keep weeds down, being careful not to damage roots. Avoid using chemical herbicides.



9. Control aphids by spraying with derris or pyrethrum according to manufacturer's instructions.

10. Protect ripening fruit with a layer of old hay, straw, special strawberry mats or plastic strips.



11. Pick berries when they are firm and evenly colored; snap off stem and avoid bruising ripe fruit.

beds are traditionally covered with hay or straw. Besides keeping the fruit clean, it acts as a mulch, conserving soil moisture. Wheat straw is harder to obtain and oat straw is more likely to carry pests. Try to obtain straw which has been properly threshed, otherwise grains left in it will sprout. Do not spread the straw until the weight of the developing berries is pulling them down to the ground. Premature strawing may cut them off from ground warmth, increasing the risk of damage from late spring frosts. Spread the straw thickly but evenly around each plant, tucking it under the fruit.

Many gardeners will find it difficult to obtain straw these days. Buy special strawberry mats or use black plastic strips instead. Keep the plastic in place with a few stones and make sure that it slopes evenly away from the plants so that pools of water cannot collect around them. If slugs are likely to be a problem, scatter a few slug pellets around the plants before putting down the fruit protector.

Protect the crop from birds with either a permanent fruit cage or with lightweight plastic netting spread over the beds. Drive in short posts and run taut wires between them. These can remain in place for the life of the bed. Invert glass jars over the tops of the posts so that the netting will slide without catching. Protect the plants with netting when the berries begin to swell, because mice and squirrels take the berries while they are still green. Make sure the netting clears the tops of the plants and can be removed easily for picking.

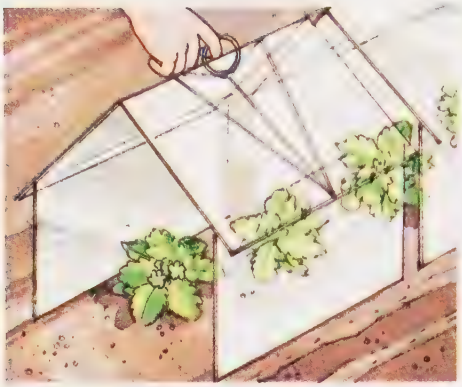
Early cropping

An extra early crop can be grown under frames or plastic tunnels or in a greenhouse. An unheated greenhouse has no advantage over frames, although a heated one will give crops from midspring. For the best results, hand-pollinate all forced strawberries to avoid misshapen unattractive fruits. Use a camelhair brush; dab the flowers daily when they have fully opened.

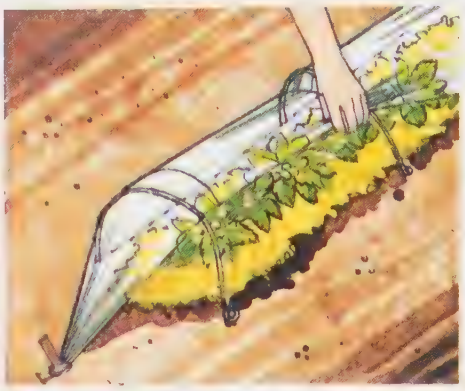
Outdoors, crops can be forwarded by three or four weeks using glazed frames, or by two or three weeks with plastic covers or tunnels. Many varieties crop earlier than usual in their first year, so do protect your maiden plants. First year plants will also be smaller, so plant them 9 in (23 cm) apart, allowing 3 ft (90 cm) between rows—the wider spacing makes the placing of covers and tunnels easier. After the maiden crop, you may wish to pull out alternate plants and leave the rest uncovered.

There is no point in using frames or tunnels too early; the beginning of real spring is quite soon enough. Before cov-

FORCING STRAWBERRIES



1. Begin forcing under covers in late winter; in warm weather, open or space them slightly apart.



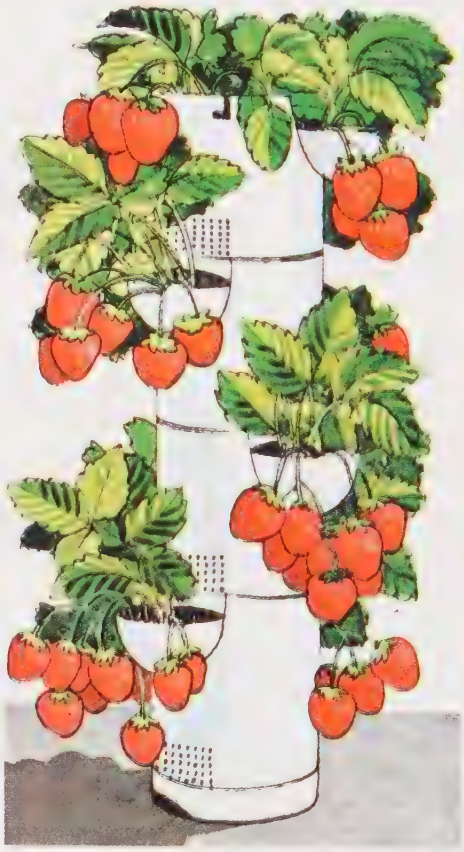
2. For strawberries grown under plastic tunnels, lift the fabric for spraying, pollinating and harvesting.

ering, weed the bed and scatter slug pellets around the plants. There is no need to "straw" the beds but the plants must be protected from birds with netting while the covers or tunnels are opened during the ripening period.

Using tunnels will lead to poor berry development unless insects are allowed to fly in to pollinate the blossom. Open the tunnel wide in the middle part of the day when the flowers are out. Most covers have spaces through which insects can enter, but in very hot weather, open them or space them 2 in (5 cm) apart.

For greenhouse forcing, plant rooted runners singly in 6 in (15 cm) pots filled with a good friable and loamy soil, doing this in early summer if possible, and certainly by late summer. Keep the pots outdoors until early in midwinter, making sure that the plants have enough water and are not cracked by frost. Once inside the greenhouse, keep the plants quite cool with no artificial heat until signs of growth can be seen, usually ten days or two weeks later. Now supply heat to raise the temperature very gradually, reaching a maximum of 50°F (10°C) by the end of midwinter. Increase the humidity by damping down.

Once the flowers have set and the berries begun to swell, allow the temperature to rise still further, ideally to 65°F (18°C), and maintain moist conditions until the fruit starts to color, when the air should again be drier. Feed the plants



occasionally with dilute liquid manure or fertilizer as the berries swell. Forked sticks or bent galvanized wire can be used to hold the fruit trusses up and keep the berries clean. Once forced, plants cannot be used again.

Container growing

Strawberries can be grown in a variety of containers. There are special pots with a number of holes in the side, or you can make your own container of this type from a barrel: drill 2–3 in (5–7.5 cm) diameter holes in the sides.

Whatever container you use you should prepare a layer of drainage material at the bottom, using broken clay flowerpots, bricks or gravel. In the case of barrels or other large vertical containers, there should be a central core of drainage material running up through the middle. Provide this by making a wire mesh tube, 4–6 in (10–15 cm) in diameter, place it in the middle of the container and fill with drainage material. The tube should end 4 in (10 cm) below the surface of the soil mix.

Use good friable well-drained soil and work upward, inserting the roots of the plants from the outside at each planting hole is reached. Make sure the strawberries are not planted too deeply or shallowly and firm the soil mix layer by layer to minimize soil settlement after planting. It is a good idea to water each layer as you proceed with the planting. Remember to water regularly, as the soil in containers dries out much more quickly than soil of the open ground. If there is water seeping from the lowest holes, it means that the soil is saturated, and no more water should be given until the soil has dried out a little.

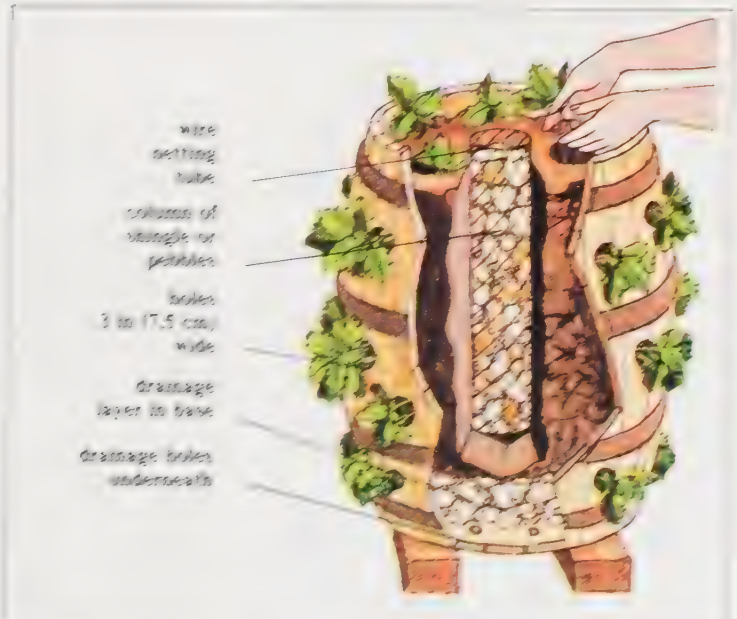
Other than regular watering and cutting off runners, container-grown strawberries need little maintenance. You can get earlier crops if you move smaller containers under cover.

Propagation

Strawberries are usually not much good for cropping after two or three years. They are tired (crowded, if in matted rows) by then. However, they are easily increased from runners. Before beginning to replace old stock from runners, make sure the parent plants are free of all pests and diseases, especially viruses. It is not worth propagating from dis-

CONTAINER GROWING

◀ If space is limited, you can grow crops in improvised strawberry pots.



➤ Old barrels make excellent containers for strawberries; make sure there is a central core of drainage material running up through the middle, so the soil mix does not become waterlogged.

PROPAGATION

1. Plunge small pots filled with well-drained soil into the soil close to the parent plant after digging an appropriate hole.

2. Peg down the runners either directly into the soil or into pots; fasten with wire hooks or stout hairpins.

3. Additional runners may form from the selected plantlet; cut these off as they drain the plant's vigor.

4. Once the plants have rooted, sever the runner from its parent plant with a sharp knife.

eased or infested plants, as future crops will be doomed from the beginning.

For the best results, select healthy, one-year-old parent plants, and do not allow them to bear fruit. By removing the flowers, all the plant's energy is channeled into the production of first class runners. The runners should be ready for pegging down from midsummer to late autumn. Although a healthy growing parent plant will produce numerous runners, select the strongest four or five, and allow only one plant to develop on each.

You can peg down the runners directly into the soil, if it has been lightly cultivated beforehand, or you can peg them into pots. Fill the pots with a good friable well-drained soil and either sink them into the ground so their rims are level with the soil surface, or stand them firmly on the surface. Peg the runners down into the soil and fasten securely with wire hooks or stout hairpins. Once the runner has rooted, a further runner may form at the point of rooting; pinch this out.

About a month after pegging down, the young plants should be ready for moving. Check that the plant has made good leaf growth, which is a sure sign of successful rooting. Then cut the runners

from the parent plant. If you are lifting the plants directly from the soil, use a trowel and make sure there is a good ball of soil around the roots. Whether they are open-grown or pot-grown, the new plants should be planted into their final positions immediately. If you do not want the young plants to crop in their first season, pick off the flowers as they form. An increased second year crop will result. Most varieties will respond well to this treatment.

Harvesting

Strawberry plants usually crop for three or four weeks. However, in very hot seasons, harvesting may be over after a week or two. Everbearing strawberries carry much smaller crops at any one time, but may continue producing berries for several months.

As soon as the fruits are full sized, they will color quickly. Pick them when the fruits are firm and evenly colored all over. Because strawberries go moldy very quickly, it is best to pick them when the weather is fine and the fruits dry. Pick over the bed daily during harvest time to avoid overripe fruit. As you inspect the beds, remove any rotting or damaged fruit to avoid the spread of disease. Burn any infected fruit; do not leave it on the ground or put it on the compost heap.

Take the strawberries with the stalk intact. Always handle the berry by the stalk, so you do not bruise or discolor the flesh. You can remove the stalk and calyx just before serving. Strawberries for jam-making can be picked with or without the stalk. Use the fruits as quickly as possible as strawberries do not remain at their best for long.

Aftercare

Late in the season, leaves begin to wither. If you leave the foliage on plants after harvesting, pests and diseases are more likely to be a problem with next year's crops. Cutting the old leaves exposes the crowns to light and air and renews their vigor. Some spring-bearing varieties will crop again in autumn if the leaves are cut after the first harvest.

There are two methods of clearing strawberry beds: burning and mowing. The first is more drastic and more likely to go wrong, although it does kill off many pests. The safer method is cutting off the leaves, and raking them up along with the straw. Use a hand sickle, shears, or, for very long beds, a mower. Remember that the crowns must not be damaged, so if you do mow over the plants, set the cutter for 4 in (10 cm). After mowing, clean the beds generally, removing stray runners and weeds. Do not put any of the rakings on the compost heap; burning them is better as it will cut down disease risk.

After the bed is completely cleaned, fork in sulfate of potash at the rate of ½ oz per sq yd (15 g per sq m). A light mulch put on at this time will also help to build up the crowns and keep the autumn crop of weeds from sprouting. Check your strawberry netting for holes, and do any repairs before you put it away.

Exhibition tips

Because strawberries can be so easily bruised, fruits for exhibition should be handled as little as possible, and picked just before the show. The number of strawberries exhibited is often 20; use scissors to cut the fruits from the plant. Remember that strawberries can be damaged by their own weight, so when packing them for the show do not put too many in one container. Display the berries on a plate in neat rows, so they can be easily counted. The judge will look for large, ripe fruit with even color and free from blemishes. The stalks, which should be fresh and green, must still be attached.

Preserving

Firm, ripe strawberries can be preserved as jam, jelly or preserves, or frozen—in a syrup or sugar pack or unsweetened. Obtain detailed instructions for these processes from an authoritative source and follow carefully for best results.

Varieties

Early strawberries

Blakemore: firm, tart and productive; popular in Middle Atlantic States.
Dixieland: early, large and firm; originated in North Carolina.
Florida Ninety: a good cropper, especially in Florida and Deep South.
Howard 17 (Premier): early, soft productive; quality fair. An old Massachusetts variety.
Konvoy: vigorous and productive in Louisiana and Gulf Coast area.
Marshall: an old variety for the Northeast; large and soft but of good flavor and quality.
Pocahontas: early to midseason; firm, deep red. Especially adapted to the upper South.
Radiance: hardy, fairly firm; resists drought. For the High Plains especially.
Redcrop: medium early, vigorous; somewhat resistant to red stele. Popular in Middle Atlantic area.
Surecrop: firm, attractive; resists red stele. Originated in Maryland.

Midseason or maincrop

Albritton: late midseason; deep red and firm. From North Carolina.
Arapaho: firm, very vigorous, hardy and drought-tolerant. Of Wyoming origin.
Catskill: popular, dependable and productive in Northeast. Quality good; virus-resistant.
Dunlap: an old, early midseason; small and soft but hardy. From upper Midwest.
Empire: light, flesh-colored but quality good. A New York introduction.
Fairfax: an early-midseason sort; large, dark and of very good quality. A U.S. Department of Agriculture origination.
Fairland: large, of good quality; resistant to red stele. USDA origination.
Lassen: good quality; productive. Originated in California.
Maine 55: vigorous; well adapted to cool climates. Resists red stele.
Northwest: vigorous and productive in cool, moist climate of Pacific Northwest; virus-resistant.
Siletz: a late midseason variety; quality good. Resists both red stele and virus diseases. Originated in Oregon.
Shasta: noted for its long fruiting season; of California origin.

Late strawberries

Armore: good quality, productive in central United States. From Missouri Experiment Station.

Royal Horticultural Society, Wisley

▲ Catskill

Harry Smith

▲ Empire

Arrowhead: vigorous, productive and hardy; from the northern Plains.
Jerseybelle: large showy variety; good exhibition sort. Especially adapted to Middle Atlantic climate.
Massey: large, well-colored berries; a USDA variety.
Puget Beauty: especially adapted to heavy soils; attractive and of good quality. Partially resistant to red stele; originated in Washington State.
Sparkle: vigorous, firm; good for freezing. Resists red stele, leaf spot, leaf scorch; a New Jersey origination.

Everbearing (*summer to frost*)
Evermore: dark, good quality, hardy; excellent in northern Plains.
Gem (Brilliant): old, light red, fair quality; widely grown.
Geneva: good; originated in New York State.
Ogallala: widely used in plains and prairie states.
Ostara: new, from Holland; so far, good in Middle Atlantic states.
Ozark Beauty: large, firm, top quality; deep color and very sweet.
Rabunda: Dutch; shows much promise.
Red Rich: midsize, deep red, high quality.
Superfection: Most sold, same as Gem.

Harry Smith

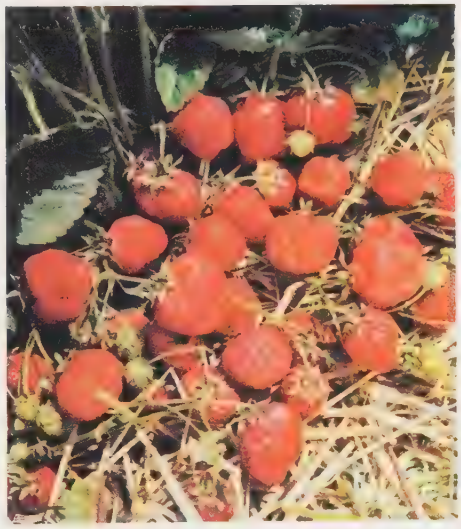
Red Rich

Pat Brindley

Surecrop

Harry Smith

Dixieland



Harry Smith

Gem

Pests & Diseases

Although the number of pests and diseases affecting strawberries is formidable, the amateur gardener is unlikely to meet more than one or two of them. Because many of the infections are not visible in the early stages, and healthy looking plants may in fact be diseased, it is extremely important to buy certified virus-free plants. Remember, though, this does not guarantee that the plants will remain disease-free permanently. It is up to you to keep your strawberry bed in good health by keeping the area clear of weeds and trash and following a locally recommended routine of spraying.

Aphids: these pests can infest strawberries from early spring onward, feeding on the leaves, so that they are curled and twisted and the plants stunted. The main danger, however, is that they carry virus diseases which are incurable.

Watch the plants carefully for any indication of aphids, starting in early spring. If necessary, spray with derris or pyrethrum.

Strawberry beetle: this is the most damaging beetle which attacks the strawberry. It is mostly black and about ½–¾ in (1.3–1.9 cm) long. It feeds on the flesh, leaving an open wound in the fruit, and sometimes removes the seeds. Because the beetle lives in rough grass, leaf litter or weeds, the best precaution is to make sure the area surrounding the strawberry bed is well cultivated and any grass is kept mown.

Red spider mite: these are not actually spiders, but tiny, pale red or orange mites which suck the sap from the leaves. The leaves then turn pale yellow or gray-brown, and the plant is generally weakened. Sometimes silken webs are visible on the leaves which are infested. Keep the plants well supplied with water as these pests thrive in hot, dry conditions, and spray with malathion as soon as any signs of spider mite appear.

Strawberry eelworm: these microscopic pests live in the buds, leaf axils and leaves of strawberry plants; the main symptoms of infestation are thickened leaf stalks, puckered leaves and generally stunted growth, but this trouble is difficult to diagnose and may need professional advice. Once the soil has been infested with eelworm, all the plants should be burned and no strawberries grown on that plot for three years. Because runners from infested plants may also carry eelworm, it is best not to propagate from diseased plants. As a further precaution against the spread of eelworm, apparently healthy runners from propagation grown in the same bed should be completely immersed in hot water (110°F, 43°C) for 20 minutes, before potting into sterilized soil. (These pests are also called nematodes.)

Snails and slugs: damage from these pests is usually worse on wet, badly drained soil, or in badly kept gardens full of debris and leaf litter. Rough holes in the leaves and berries, and silvery slime trails are the most usual symptoms. The best precaution is to keep your garden clean and freely drained; controls are either slug/snail pellets or containers of sweetened milk sunk in the soil.

Strawberry weevil: the adults of various types of weevil attack the stalks of the leaves, flowers and fruit, breaking them off, and may feed on the developing fruit itself. In a bad infestation (which, however, seldom occurs), the crop can be severely damaged without this being realized until too late. If you see stems

Donald Smith

▲ *Pale yellow crinkled leaves with silken webs; signs of red spider mite infestation.*

hanging limply on many plants, suspect weevils, remove and burn all the damaged parts, and spray or dust the plants and soil with derris or Sevin.

Cyclamen mite: these are most destructive only in certain areas and during very warm weather. The minute colorless insects hibernate in the plants and feed on the unfolding leaves which remain small and become brown with down-curled edges. The mites remain inside the folded leaves or low down in the crowns of the plants, and chemical controls available to the gardener are not very effective. Keeping the plants well watered helps; spraying well with a miticide in spring and early summer gives some control.

Botrytis: sometimes called gray mold, this fungus is worse in wet weather, when it can quickly turn berries into rotten, furry fruits useless for eating. Some varieties are more susceptible than others. Where troublesome, do not plant types that are particularly vulnerable. It is spread both by spores carried on the wind and by contact with diseased fruit, and so healthy berries can quickly become diseased. Because many weeds are host plants for botrytis, a weed-free garden is less likely to be infected. Plants grown in cramped, badly ventilated conditions, whether in the open or under glass, are also very vulnerable. Remove and burn any moldy berries immediately, and, as a precaution, the plants can be sprayed with an approved fungicide according to manufacturer's instructions, but not fruit which is to be preserved in any way.

Leaf spot: this fungal disease rarely causes any serious trouble. Tiny dark red circular spots appear on the leaves late in the season. If the infection is severe, the spots join up and the whole leaf withers. Cutting off the foliage after harvesting is a good control, and spraying with a good fungicide in midspring the following year, if the attack was bad, is a good preventive measure.

Strawberry mildew: some older varieties are particularly susceptible to strawberry mildew, which appears as dark blotches on the upper surfaces of the leaves and gray patches beneath. Eventually, the leaf edges will curl upward, and show the fungal growth beneath. Spray with a fungicide just before the plants flower, and two or three times again, at two-week intervals.

Red stele: this is a serious root disease affecting strawberries, and is most likely to occur on badly drained soils. The soil-borne fungus turns the roots of an infected plant black or brown on the outside, with a red center. Above-ground symptoms are stunted plants with wilted leaves, later reddish or brown, and fruiting poorly. Usually only a few plants in a whole bed will be infected to start with; eventually more and more plants look as though they were suffering from

Shell Picture Library

▲ *Strawberry beetles feed on the fruits, and remove the seeds from the undersides.*

Murphy Chemical Co.

▲ *Botrytis, or gray mold, can quickly turn berries into rotten furry, inedible fruits.*

drought, wilt suddenly and die. Unfortunately, there is no completely effective cure; affected plants should be lifted and destroyed, and the land left free of strawberries for at least 13 years. Some varieties, however, are more resistant than others, for instance Fairland, Puget Beauty and Sparkle show promise, although there are several disease strains. Only Stelemaster resists.

Verticillium wilt: if you are growing potatoes near your strawberry patch and they have verticillium wilt, it is likely your strawberries are also infected. This soil-borne fungal disease causes plants to wilt for no apparent reason; leaves turn brown and die, and any fruits are small and malformed. There is no complete cure, once infected, and plants are best burned, but soaking with a fungicidal solution will give some control.

Yellow edge: this virus is spread by aphids; it is also called Little Leaf because the leaves of infected plants gradually become smaller and smaller. The young leaves of infected plants develop yellow edges. The symptoms are most noticeable in midspring or early autumn, less so in summer.

Crinkle: there are two forms of this viral infection: mild and severe. Mild crinkle shows as tiny spots on the leaves and may affect cropping slightly. Severe crinkle is much more serious; symptoms are numerous yellow spots on the leaves, which become crinkled and wrinkled.

Arabis mosaic virus: the symptoms of this virus, which is spread by eelworm, vary according to the variety of strawberry grown, but generally the leaves become blotched with yellow and the plant's fruiting capacity is diminished. Try not to grow strawberries too near hedges, etc., as eelworms are much more numerous in the soil near hedges.

Green petal: the symptoms of this disease can first be seen in spring; the leaves are small and curled upward, and the flowers have green petals instead of white ones. Any fruits which form will be small, misshapen and very seedy. In late summer, infected plants will have gray-green leaves which wilt inexplicably; any leaves which form later will be small and yellow. Many garden weeds, particularly clover, are host plants for this virus. Leaf hoppers transmit the disease from host plants to strawberries.

GUIDE TO STRAWBERRY TROUBLES

Symptoms	*Probable causes*
Stunted plants with curled, twisted leaves	Aphids
Holes in flesh, seeds removed from underside of berry	Beetle
Leaves pale yellow or gray-brown, silk webs on leaves	Red spider mite
Stunted growth, thickened leaf stalks, puckered leaves	Strawberry eelworm
Holes in leaves and berries, silvery slime trails	Slugs
Leaves stunted, brown with down-curled edges	Cyclamen mite
Fruits, leaves covered with gray, furry mold	Botrytis
Tiny dark red circular spots on leaves	Leaf spot
Dark blotches on upper surfaces; gray mold beneath	Strawberry mildew
Plants stunted with wilted leaves; roots black or brown on outside, with red center	Red stele
Plants wilt for no apparent reason; fruits small and malformed	Verticillium wilt
Young leaves develop yellow edges, new leaves small	Yellow edge virus
Leaves have yellow spots, become crinkled and wrinkled	Crinkle
Leaves blotched with yellow	Arabis mosaic virus
Flowers have green petals, fruits misshapen and seedy	Green petal virus
Stalks of leaves, buds and fruit partially or completely severed	Strawberry weevils

growing ideas

A Pretty Tasty Vegetable

Swiss chard is an easy vegetable to grow in any garden. It thrives in a shady spot—usually the most difficult bit of the vegetable garden to fill.

Closely related to beets and sugar beets, Swiss chard is grown for its stems and leaves rather than for its roots. It is one vegetable which is almost exclusively a crop for the home grower, as it is too bulky and wilts too quickly for a commercial crop. The stalks and midribs of the leafy foliage are cooked like asparagus, while the delicately flavored green part of the leaf is boiled and served like spinach. The vegetable has a very high vitamin content and makes a welcome change from the usual cooked greens. When young, the leaves can be used chopped in salads.

Swiss chard is ideal for filling that partially shaded corner of the vegetable patch. It is not particular about soil, so long as the ground is well drained. Double dig the chosen site in the late autumn or early spring before sowing. Work in plenty of manure. Apply a top-dressing of fish manure, if this is available in your area.

It is a good idea to make several sowings, to provide plants for cutting all

Bernard Alfieri

▲ *The succulent stalks and green leaves of Swiss chard make excellent cooked vegetables.*

year in mild climates. A midspring sowing will be ready for cutting from summer through to early winter, while a late summer sowing should give good winter and spring crops. Take out drills 1 in (2.5 cm) deep and 15 in (38 cm) apart. The seeds are sown in areas about 12 in (30 cm) apart in the drills. Sow two or three seeds at each location, and thin the seedlings so that the strongest one is left at the site. Germination should be quick during normal spring weather, and seedlings should appear in 14–21 days.

Like all leafy vegetables, Swiss chard needs a lot of water to produce a good crop of large leaves. Water liberally, especially if the weather is hot and dry. If the ground was well prepared before sowing, no additional feeding should be necessary. However, an occasional feeding with dilute liquid manure could be beneficial on poorer soils.

It is important to keep the ground around the plants free of weeds, so hoe regularly throughout the growing period. You could keep the weeds down by placing sheets of black plastic between the rows, held down with stones. Alternatively, apply a mulch of manure or peat around the plants; this will serve the dual purpose of keeping down weeds and conserving moisture.

Swiss chard should be ready for harvesting about nine weeks after sowing. Gather it by breaking off the stems at the base. Always take stalks from the outside

harvesting Swiss chard

of the plants. You can remove a few leaves from each plant at regular intervals as soon as the leaves are large enough. Never strip a plant of all its leaves, and do not pull the whole plant.

Remember that Swiss chard does not store at all, so pick it immediately before use and take it straight into the kitchen. Young leaves make delicious salads, while the older leaves and stalks can be cooked and served as a hot vegetable in a variety of ways.

The plants can be left in the ground over the winter where the climate is mild. Put a layer of straw over them to protect any new leaves.

In the spring following planting, remove any dead or rotting outer leaves from the plants left over the winter and hoe in a top-dressing of a nitrogenous fertilizer. Within a few weeks there will be a new crop of leaves ready for harvesting. In the early summer these plants will start to produce flower stems. Their useful life is over; dig them up and put them on the compost heap.

Swiss chard is one of the most trouble-free plants in the vegetable garden. Most diseases leave it completely alone, and the only pests you are likely to see are slugs. Scatter slug pellets if these are a problem. Seedlings may occasionally dampen-off, but this should not happen if they are well cared for and thinned before they get too large.

You can grow a few Swiss chard plants in a large tub or trough, as long as it has a depth of at least 1 ft (30 cm) to accommodate the roots. Mix well-rotted manure into the potting mixture. Sow the seeds exactly as you would for an outdoor crop, and thin the seedlings to a spacing of one every 1 ft (30 cm). Water the containers regularly; they may need a thorough soaking twice a day during the height of summer. The containers can be put in a cold frame or a greenhouse for winter protection.

Most seed merchants offer two varieties of Swiss chard, one green and one red. The green variety is sold under the names Fordhook Giant or Perpetual, or simply Swiss Chard. The red variety, sold as either Rhubarb Chard or Ruby Chard, has long, crimson stalks with dark green leaves. It is pretty enough to grow as an ornamental plant, as well as being a delicious vegetable.

step-by-step growing guide

Tomatoes

Lycopersicon esculentum (fam. *Solanaceae*)
Perennial, cultivated as an **annual**
Sowing to harvesting time: 15–18 weeks, depending on variety
Size: plants 1½–4½ ft (45–135 cm) tall, depending on variety
Yield: greenhouse tomatoes about 8–12 lb (3.6–5.4 kg) per plant; outdoor tomatoes 8–15 lb (3.6–7 kg)

Tomatoes have always been one of the most popular crops for the amateur gardener. Once regarded as inedible and solely ornamental, with the development of improved varieties most gardeners now grow them in quantity for the table. However, it is important to remember that the crop is native to a fairly hot, dry climate. High summer temperatures suit them perfectly, but since that kind of weather cannot be expected every year in certain climates, some care must be taken to give tomatoes the right growing situation.

Tomatoes do not like damp, cool, cloudy conditions, and they cannot stand frosts. Bearing these facts in mind, there is no reason why anyone should not do well with the crop.

Tomatoes cannot be grown outdoors without protection before all danger of frost is past. Since frosts can occur until mid-May in Boston and Chicago up to the end of spring and may return in midautumn, the time left for cropping is short. Allowing for a growing period of from 15–18 weeks, it is possible to sow the seed outdoors in late spring and harvest a crop in late summer, although the farther north one lives the more hazardous this is. Alternatively you can buy young tomato plants from a nursery. Protective covers and frames can be used in several different ways to give you a better chance of a good outdoor crop.

Tomatoes started indoors

Most gardeners save growing time by starting tomato plants under glass, intending them to be transplanted outdoors later. There is no doubt that a greenhouse gives the very best conditions for a successful crop extra early.

Soil

Tomatoes will grow in almost any reasonably rich soil, or even in a basically poor soil if plenty of nutrients are supplied during the season. A greenhouse soil bed can be prepared for tomatoes by flooding with water about a month before planting to insure good water reserves in the subsoil (this is very important) and then, when the soil is

workable, by working in rotted organic matter such as farmyard manure at the rate of one barrowload per 4 sq yd (3.5 sq m). About 7–10 days before planting, fork into the top few inches a dressing of a commercial vegetable fertilizer at the rate recommended by the makers. However, after a few years of growing tomatoes in the same soil, pests, bacteria and fungi will multiply in a greenhouse, so precautions must be taken. Either sterilize the soil each year or introduce new soil mix. A homemade mixture can be made of four parts good, sieved loam (preferably a fairly heavy one), one part well-rotted farmyard manure or garden compost, one part coarse sand (all parts by bulk), together with 4 oz (120 g) of a potato fertilizer, and ¾ oz (22 g) lime per bushel of the mixture. Mix together well and leave for ten days before use.

Isolate this mixture from the soil of the greenhouse floor by growing the plants in boxes or containers separated from the ground by staging or a sheet of plastic.

A popular method in Britain is to use "grow-bags," which are plastic sacks filled with a suitable mixture. Normally bought complete and ready for use from garden supply centers, they prevent the tomato roots from coming into contact with contaminated soil.

Sowing

Sow the seed in boxes, pots or trays of well-draining sieved loam or seed mixture from midwinter to early spring. Sow each seed separately, about ¼ in (0.6 cm) deep and 1 in (2.5 cm) apart. Cover the seed box with glass and brown paper or black plastic until the seeds start to germinate in about 7–14 days. Then remove the covering and expose the seedlings to as much light as possible, without burning them.

Tomatoes require a germination temperature of about 60° F (15° C). That temperature should be maintained, if possible, throughout the life of the plant; 50° F (10° C) is about the lowest permissible level, while 80° F (27° C) is generally considered to be the upper limit. If you are sowing before spring, sow more seed than you might think necessary. This earlier sown seed has a tendency to produce a percentage of inadequate, fernlike plants with ragged leaves—because of poor light. These must be rejected, as they will never crop well.

Transplanting

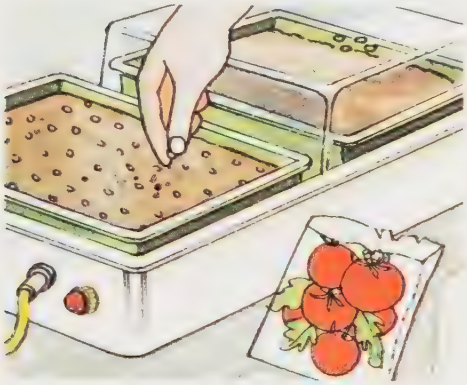
Transplanting is done in two stages. When the seedlings have grown two seed leaves, and the first true leaf is starting to appear, they need to be moved to give them more growing space. It is usual to transplant them into 3 in (7.5 cm) pots, often into peat pots or small flats made of plastic containing a suitable potting soil mix for tomatoes. The young plants remain in the pots, in maximum light, to grow into strong, bushy specimens. When they are 5–6 in (12.5–15 cm) high they are ready to transplant into their permanent bed, which in the greenhouse can be a pot, box or grow-bag, or a soil bed in the greenhouse floor. At this stage each plant will probably have its first truss of flowers beginning to open.

When transplanting, handle carefully, keeping the soil in a ball around the roots. Make sure that both the soil around the plants and the soil into which they are to be set are thoroughly damp, but not saturated. Dig a hole large enough to take the entire contents of the pot in which the plant has been growing. Fill the hole with water if the weather is very dry and quickly transfer the plant and its surrounding soil into it. Press the soil firmly around the stem.

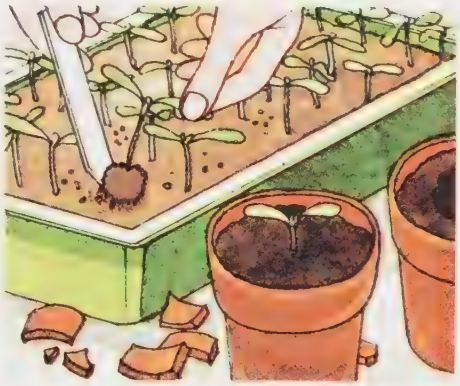
Support

Well-grown tomatoes should yield 8–12 lb (3.5–5.5 kg) of fruit per plant in a season. This is a heavy weight for a plant with a thin stem, so the plant needs support. A string (3- or 4-ply twine) may be suspended for each plant from an overhead wire, attached at the lower end to a wire hook plunged into the soil, about 9 in (23 cm) deep, or to a wire running horizontally about 1½ in (3.8 cm) above the soil, along the row of plants. As the

GROWING OUTDOOR TOMATOES



1. Sow tomato seeds in a propagator from late winter onward. Space the seeds about ½ in (1.3 cm) apart.

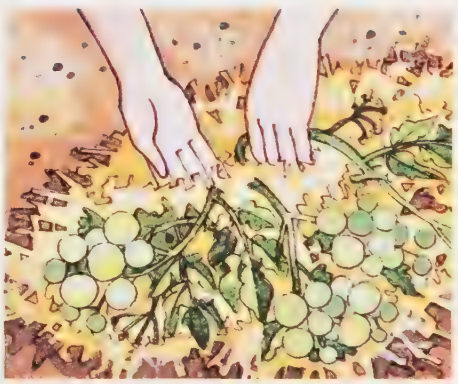


2. When seedlings are large enough to handle, move them into 3 in (7.5 cm) pots filled with potting soil.

3. When the plants are 5–6 in (12.5–15 cm) high, transplant them to permanent beds and tie to stakes.

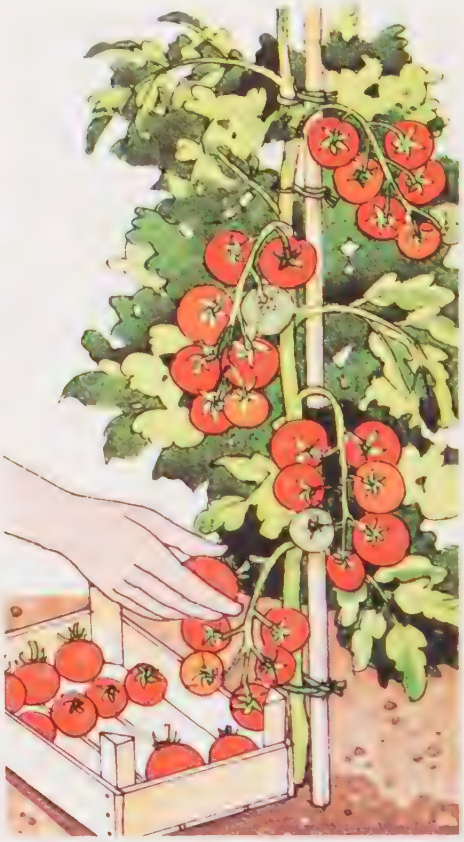
4. If growing single-stem varieties, remove axillary shoots with a clean knife to control the plant's growth.

5. Give liquid fertilizer as soon as the fruit begins to swell, and repeat every two weeks until harvesting.



6. If growing without stakes, put dry straw on the ground under the plants to protect them from rot and slugs.

7. When six or seven trusses are ripe, stop the stem one leaf above top truss.



8. Harvest tomatoes as they ripen, leaving the calyx on the fruit.

plant grows the string is twisted gently round it taking great care not to snap the top of the plant.

Ventilation and shading

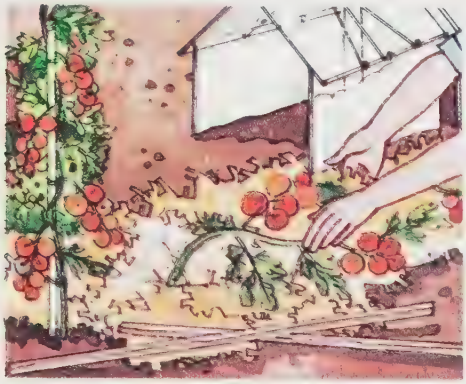
Adequate ventilation is essential—stagnant air allows diseases to develop. Open doors and ventilators as much as possible, avoiding drafts to the plants. Attempts to save on heating costs by keeping ventilators closed may result in attacks of molds and mildews, which thrive in stuffy atmospheres. It is better to keep the plants well aired, albeit slightly chilly.

Provide shade for the plants whenever the temperatures rise above 80° F (27° C) by painting the glass with a proprietary shading compound—there is one which is opaque in sunny weather, and translucent in rain. Alternatively a mixture of quicklime in enough water to make it milklike, with a little size added for sticking, can be used. You may of course have Venetian or roller blinds attached to the ridge outside the greenhouse which can be used as needed, on the south side. Without shading, leaves may burn and have brown patches.

Pollination

Greenhouse plants may need some assistance with pollination. The pollen needs exactly the right atmospheric humidity to adhere to the female parts of the flowers and to grow down toward the ovule. The remedy is to spray the plants and the air with water, preferably in the early morning. Or, more modern, spray with a blossom-setting hormone.

9. Pick by severing the stalk at the knuckle just above the calyx.



10. To ripen green fruit, lay the plants on straw and use protective covers.

Sideshooting and stopping

As soon as flower trusses start to form, the plant will begin to produce shoots in the joints between stem and leaf. By nature, the tomato is a bushy plant, but allowing these shoots to grow will result in a mass of bushy foliage and a lot of undersized fruits. Remove sideshoots by pinching them out with thumb and finger as soon as seen. This pinching out should be repeated every two or three days, for the shoots grow quickly. Early morning is the best time for the job.

Toward the end of the season, when the plant is bearing six or seven trusses of fruit, stop the plant, i.e., break off the growing tip cleanly, just above the second leaf above the top truss. The plant can then concentrate all its resources on developing and ripening the fruit on the existing trusses, rather than trying to form more leaves.

De-leafing

Removing the lower leaves of the plant will encourage it to channel its resources into fruit production and improve ventilation close to the soil. But leaves, as long as they are green, are important to a plant—they are food factories—and removal should be approached with caution. Remove only the leaves beneath the lowest truss of fruit and one or two which may be shading it. Using a sharp knife, remove the chosen leaves completely, so that a clean cut is made flush with the stem. Later on in the season, when the life of the plant can be a few weeks more at most, remove the leaves more drastically to promote ripening before the cold weather comes.

Any leaves that turn yellow should be removed completely whenever they appear.

Feeding and watering

Tomatoes need plenty of moisture, but not a saturated soil. In soil beds, they should be watered heavily whenever the soil has become dry on the surface. In containers, daily watering is usually necessary, twice daily in hot weather. In greenhouses, a daily dampening in hot weather is important. This involves spraying the plants, paths, benches and walls of the greenhouse in the morning and at midday.

To produce the highest possible yield tomatoes need generous feeding. Greenhouse tomatoes will certainly benefit from a regular application of nutrients. It is quite satisfactory to use a proprietary potato fertilizer, following the instructions on the container. If you do want to mix your own, 2 parts sulfate of ammonia, 3 of superphosphate and 2 of sulfate of potash (all by weight) make a good, general fertilizer, applied every seven to ten days from the time the fruits begin to swell, at the rate of about a teaspoonful sprinkled in a wide circle around each plant.

Proprietary potato fertilizers generally

GROWING IN A GREENHOUSE

1. Support plants by twisting on a soft twine tied to horizontal wires at the top and bottom of the greenhouse. For easy removal later, tie the string to the top wire, as shown in the insert.

contain a fairly high proportion of potash, of which the plant needs liberal supplies for most of its life. Toward the end of the season, however, it will require more nitrogen to support its long stem and foliage. If the top shoot becomes thin and spindly before the plant is at the stage of pinching out, switch to a fertilizer with a higher nitrogen and lower potash content.

If, as the plant grows larger, the lower leaves start to turn yellow between the veins, the plant is probably deficient in magnesium. Correct this by spraying the plants with a solution of magnesium sulfate (Epsom salts) at the rate of 2 oz per gal (60 g per 4.5 L) of water, about once a week. This condition sometimes occurs when a potato fertilizer with a high potash content has been used too heavily. The plants absorb potash in preference to magnesium.

Harvesting and aftercare

The bottom trusses ripen first. Pick tomatoes before they are quite ripe. Remove the fruit by severing the stalk at the "knuckle" just above the calyx. Orange-red tomatoes can complete their ripening on a windowsill within a few days, and their removal before they are fully ripe will enable the plant to divert its resources to fruit at an earlier stage of development.

When the first frosts are imminent, harvest all the tomatoes, whatever their color. Orange, yellow and even some of the green ones will ripen indoors if each is wrapped in paper, and placed in a warm dark place, although they may take several weeks to do so. Those too small to ripen can be used for relish.

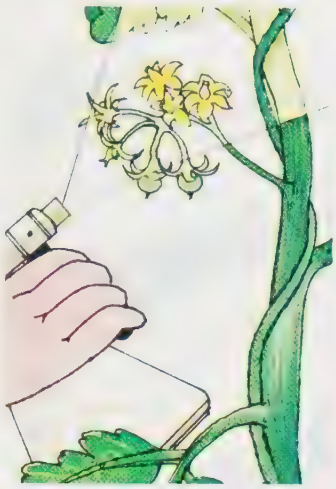
Burn old plants including the roots. Do not put them on the compost heap, for they may well be carrying disease.

Extending the tomato season

The main advantage of taking the trouble and expense of heating a greenhouse in spring to bring on tomato plants is to have tomatoes quite early in the season, in midspring to early summer when prices are still high in the stores. There is not much point in sowing seed in autumn to try for a late winter or early spring crop, because the daylight hours are so short in late autumn and winter that seeds sown before winter will usually produce little for many weeks unless artificial lighting is employed, and even then extra lighting will be required for the plants.

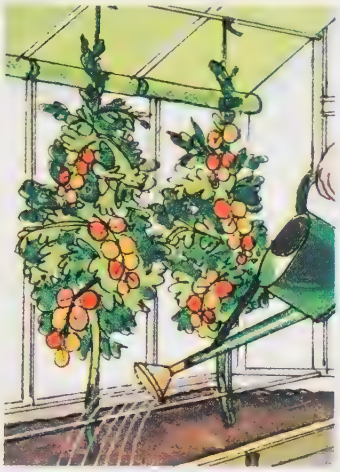
It is possible, however, to extend the tomato season until the very end of the year by planting young plants in a greenhouse in midsummer and providing them with sufficient heat when the frosts come.

Step-by-step Growing Guide for Tomatoes



2. During the first three weeks remove the leaves below the bottom truss in stages to allow for free air circulation.

3. Spray flowers with hormone each morning to encourage pollination and set fruit.



4. Keep plants well watered and mulch with peat to conserve moisture. Shade from the hot sun with blinds.

5. To ensure that set fruits grow, remove the growing tip at the top wire at least three leaves beyond the last truss.

Outdoor tomatoes

Because the natural home of tomatoes is sunny, choose a plot which gets the maximum amount of sunshine. A site not far from a wall, but unshaded by trees, is ideal since the plants also benefit from shelter from wind.

Ideally the soil should be dug over during the autumn and allowed to weather. If it is available, plenty of well-rotted farmyard manure or garden compost should be dug in at the same time, especially if the soil is light.

For outdoor tomatoes the seed is sown in early spring in seed boxes, in pots on a windowsill or in a heated greenhouse. Follow the sowing instructions for greenhouse tomatoes. Transplanted to their outdoor site in late spring, they should produce fruit by midsummer and continue cropping until frost checks them. Alternatively, buy young plants for setting out in late spring. After planting in the outdoor bed, cover the plants with flowerpots for several nights, just in case the temperature falls low. When they are growing strongly cover them with newspapers if the temperature falls below 50° F (10° C).

Outdoors, stakes are the simplest method of supporting the plants. Tie the plants to 6 ft (1.8 m) canes with twine.

Outdoor plants will pollinate themselves without trouble. They will also tolerate temperatures far above 80° F (27° C) if they are given sufficient moisture. If it has been applied, farmyard manure will help to conserve moisture, but during a drought heavy daily watering is necessary, a gallon (4–5 L) a day is not too much per plant.

The sideshoots should be pinched out exactly as for greenhouse tomatoes, and the leading shoots should also be stopped after the formation of five trusses or so.

A very rich soil outdoors may provide all the nutrients the tomatoes require, but they are gross feeders. So if the tomato patch is not generously supplied with organic material, liquid feeding exactly as for greenhouse tomatoes will be helpful.

Bush tomatoes

Bush varieties are now available from most seed merchants. These are frequently the same types that are grown unstaked in fields for commercial canning, ketchup, etc.

The instructions for staking, pinching out sideshoots and stopping leading shoots do not apply to bush tomatoes. Simply allow them to grow freely. They will form small bushes about 18 in (45 cm) high and 18 in (45 cm) in diameter.

Soil, manuring, watering and general culture are all the same as for ordinary tomatoes. Each plant will produce a mass of fruit, usually much smaller than the ordinary tomato but with a delicious flavor. The stems will sag under the weight of the fruit, so it is advisable to put a layer of straw or plastic over the ground beneath the bushes to keep the fruit clean.

The bush tomatoes include a number of novelties. There are plum-shaped tomatoes, pear-shaped varieties, tomatoes that grow on "strings" like currants, and yellow bush tomatoes.

Ring culture

Ring culture is an excellent method of growing tomatoes. It is well suited to the greenhouse, but may also be used outdoors. With this method, the plants are grown in bottomless "rings," 9–10 in (23–25 cm) wide and 9 in (23 cm) deep, set on a base of moist aggregate (coarse sand, gravel or pebbles). The base may also be made of weathered ash or clinkers, or three parts (by volume) of gravel to one part of vermiculite. The plants develop fibrous roots which draw nourishment from the soil mix in the rings, and longer roots which derive moisture from the aggregate below it.

The rings should be placed 15 in (38 cm) apart in rows 18 in (45 cm) apart. Fill each ring to within ½ in (1.3 cm) of the top with potting mixture two weeks before planting, in order to give the mixture time to warm up. Water soil mixture and aggregate two days before the plants are set out. Give an initial quart (liter) of water to each plant through the rings, but do not water through the rings again unless the plants wilt in hot weather. Keep the aggregate wet. In about ten days, the roots should reach the aggregate. After this, water the aggregate only, keeping it permanently moist. In a hot summer you will need to give about 2 qt (2 L) daily for each plant, but less if the weather is cool and dull.

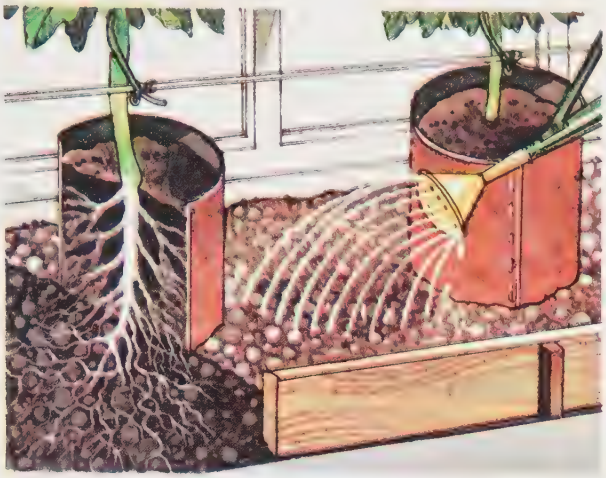
Make sure plants are properly supported, either with stakes put in a week after planting, or with wire and string, as for soil bed plants.

When the fruit begins to form on the first truss, begin giving weekly liquid feedings through the rings at the rate of 1 qt (1 L) per plant. The feed should be high in potash. Halfway through the season, add a 1 in (2.5 cm) deep topdressing of fresh potting mixture or granulated peat. Otherwise, follow all cultivation and pruning instructions as for greenhouse or outdoor tomatoes.

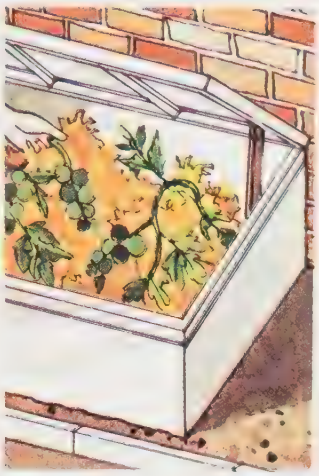
Growing in a cold frame

Both cold frames and protective covers will give a more certain chance of tomatoes developing outdoors. Because the plants can be put out considerably earlier than without protection, the tomatoes thus have a longer period of growth.

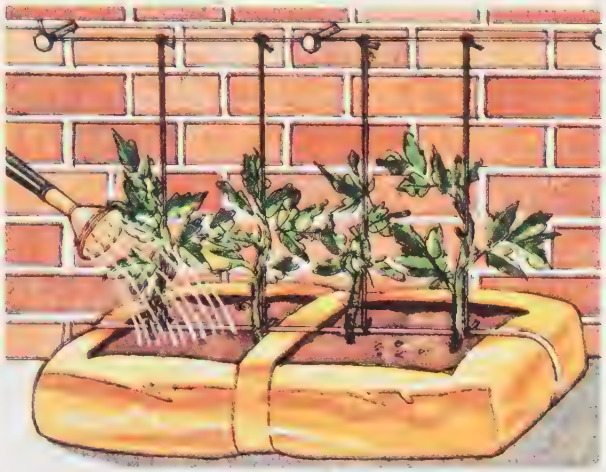
ALTERNATIVE GROWING METHODS



Grow plants in bottomless rings on a bed of aggregate; feed and water via the rings.



Set low tomatoes in frames; train forward.



Single-stem plants growing in a peat bag. Plants are supported with strings tied to a horizontal wire.

Plants grown on stakes in a trench and cloched.

Choose a slightly shaded, south-facing site, sheltered by a wall if possible, for your frame. Prepare the soil in winter as for outdoor cultivation, and raise the seedlings in the way described above, or buy young plants. Put the plants in the frame in early to midspring, or mid- to late spring for bush varieties. Two weeks before planting out, water the soil thoroughly and let the soil warm up. Ten days before transplanting the young plants from their 3 in (7.5 cm) pots, give a top-dressing of three parts rotted garden compost to one part granulated peat, with 3 oz (90 g) of bone meal to each bushel of the mixture.

Set the plants toward the back of the frame. Leave 18 in (45 cm) each way between single stem (cordon) types and train them along a cane from the back to the front of the frame. Leave the same planting distance between bush varieties.

The Iris Hardwick Library

▲ *Small globe tomatoes thriving in pots against a sunny wall.*

Otherwise, grow as for outdoor tomatoes. Another method of using a frame is to upend it against a wall and use it to protect three or four tomato plants in pots or boxes.

Growing under English cloches

Prepare the soil as for outdoor cultivation. Then, if growing single-stem tomatoes, dig a V-shaped trench, 6 in (15 cm) deep, 12 in (30 cm) wide at the top and 6 in (15 cm) wide at the bottom, a week before planting. Add the same top dressing to the bottom of the trench as used for growing under frames.

Set the plants out in early spring in warm areas, but a little later in cooler districts. Plant bush types 3 ft (90 cm) apart and staked types 18 in (45 cm) apart. Extra height can be gained by standing the cloches on bricks, or you could use tall barn cloches for even more height. Remove the cloches from cordon types when the growing tips have nearly reached the tops, and thereafter treat as outdoor tomatoes. (A few dealers sell cloches.)

Container growing

Even without a garden, small quantities of tomatoes can be grown in pots, troughs, peat bags or even rings, on patios and balconies. Cultivate the plants in the same way as normal garden

tomatoes. All containers except peat bags must hold a minimum depth of 7 in (17.5 cm) of a reliable potting mixture. Support the plants with canes or by looping soft twine around the base of each one and tying the other end to a horizontal wire held to a wall with nails. Give regular liquid food as well as watering frequently. If using peat bags, water carefully to avoid excess moisture at the roots.

Exhibition tips

To grow big tomatoes, plants with an unusual number of trusses, or plants with an unusual amount of fruit per truss, try this method: instead of staking the plant, allow it to fall over and grow along the ground. The soil must contain well-rotted manure or garden compost.

Peg the stem down at intervals. At the points where it is pegged it will grow more roots. The plant will then absorb nourishment from perhaps four to eight times as many roots as a normal plant would, and should produce a correspondingly greater weight of fruit. This technique can also be used with indoor tomatoes in a heated greenhouse for an early start, but it is primarily successful outdoors.

For a prize-winning truss, select one truss and remove all the others, so that the plant's resources will all be used by the one remaining.

For a single, prize-winning tomato, leave only one on the plant. Spray it frequently with lukewarm water so that it does not burst its skin.

Companion plants

Marigolds, particularly the French variety, help to repel whiteflies, one of the most common of tomato pests. Abroad, there are some commercial growers who have marigolds growing in their tomato greenhouses.

There are also plants which have a detrimental effect on each other. Growing potatoes and tomatoes near each other is to be avoided, because they are members of the same family and therefore attract the same problems.

Pests & Diseases

Tomato hornworm: large green caterpillars—larvae of sphinx moths, devour leaves of tomatoes, eggplants, peppers, potatoes, ground cherries, etc. Pick off or spray with malathion.

Cutworm: grublike larvae cut the stems of newly set-out plants near the ground. Scatter cutworm bait when planting.

Eelworm: both the potato root eelworm and the root-knot eelworm can infect tomato roots, causing stunted growth, discolored leaves and wilting plants. In severe infestations, plants may die. Plants infected by eelworm usually have tiny cream-colored cysts on the roots. There is no satisfactory chemical control for eelworm available to gardeners. Dig up and burn every scrap of the infected plants, especially the roots, and avoid growing tomatoes on the same ground for at least five years. Or plant marigolds in this area as well as among the tomatoes for several years—scientifically proven effective.

Red spider mite: tomatoes grown under glass are especially susceptible to red spider mite. The mites lay their eggs and feed on the undersides of the leaves, producing a reddish mottled look. Fumigate the greenhouse or spray with derris or malathion.

Whitefly: these can be one of the most troublesome tomato pests, and they can

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Serious damage to both fruit and leaves caused by an infestation of whitefly.

GUIDE TO TOMATO TROUBLES

Symptom	*Probable cause*
Red mottling on underside of leaves	Red spider mite
Limp, curling leaves, sticky black patches; tiny white flies on undersurface	Whitefly
Small, round leaves; yellow spots, brown fur on underside	Leafmold
Dark brown blotches on leaves, stems and fruit	Potato blight
Mottled yellow and crinkled leaves	Mosaic virus
Bronze-brown spots on leaves	Spotted wilt (virus)
Wilting yellow leaves; eventually whole plant wilts	Verticillium wilt
Patches of gray fur	Gray mold
Long, thin, threadlike leaves	Enation mosaic virus
Transparent spots on fruit with "halo" around them	Water spot
Hard patches on fruit around calyx	Greenback
Yellow patches on red fruit	Blotchy ripening
Hard, sunken dark patch on fruit at blossom end	Blossom end rot
Brown rings around stem at base	Stem rot
Stunted growth; lumps or cysts on roots	Root knot eelworm Potato eelworm
Leaves eaten; green caterpillars	Tomato hornworm
Newly set-out plants cut off near ground	Cutworm

attack both greenhouse and outdoor plants. The adult flies, which look like tiny moths, lay their eggs on the undersides of leaves. The immature insects feed on the leaves, secreting honeydew which encourages sooty mold to form. The leaves look grayish and curling. As soon as you see whitefly, spray with malathion.

Leafmold (Cladosporium): this very common greenhouse disease is a fungus which causes yellow patches on the leaves. The undersides of the leaves are often covered in a brown or purple mold. The damage to foliage can be quite severe, and the flowers and fruits can also be affected. Leafmold is most likely to appear where the temperature and humidity at night are high, so maintain good ventilation. Watch for the disease and, if necessary, spray. Some varieties are cladosporium-resistant.

Gray mold (Botrytis): this fungus thrives in excessively moist atmospheres such as an unventilated greenhouse. Infected parts (leaves, stems or fruit) grow patches of gray fur, beneath which the plant tissue rots, and eventually the whole plant may die. Prevent by careful ventilation; remove and destroy any infected plants, or parts of plants. The cuts on plants which result from this can be treated with an approved fungicide.

Water or ghost spot: this is caused by the spores of gray mold germinating on the fruits but then drying up because of a change to warm dry conditions. It shows as small, transparent rings on the stem of the fruit and does not cause any real damage. Try not to overwater or splash water on the setting fruit.

Potato blight: this disease also attacks tomatoes, which are members of the same family, so take precautions not to grow potatoes and tomatoes in the same ground or too near to each other. Infected plants have dark brown to black patches on the leaves and eventually develop brown-black patches on the fruit. Destroy any affected leaves as soon as you see them. Spraying with a recommended fungicide in mid- to late summer is a good preventative measure.

Verticillium wilt: a fungus disease which infects the roots of the plants, and is soilborne. First symptoms are the wilting of

the top leaves in hot weather, then the lower leaves start to turn yellow; gradually the whole plant wilts and becomes permanently limp. If the stem is cut through horizontally just above soil level, there will be a brown stain in the internal tissues. Infected plants cannot be cured, but mulching close round the stem with moist peat will encourage the plant to put out new healthy roots, which may just save it sufficiently to ripen some of the crop. Spraying the plants daily and lowering the temperature by shading or more ventilation will also help. Destroy infected plants at the end of the season, especially the roots, and sterilize the soil if tomatoes are to be grown there again. Select resistant varieties.

Greenback: fruits have hard green patches around the stalk which never color. The cause may be exposure to too much sun and/or lack of potash.

Blotchy ripening: another functional disorder; parts of the fruit remain orange, yellow or pale green and never ripen. Insufficient potash is the cause.

Split fruit: this occurs as a result of irregular water supplies, when a lot of water is given after a prolonged dry period.

Stem rot (Didymella): this is a fungus disease which produces a corky infection that girdles the plant stems at soil level. The plants then wilt, and can be completely destroyed. Badly affected plants should be removed and burned but, if the disease is seen early, spraying with an approved fungicide may help.

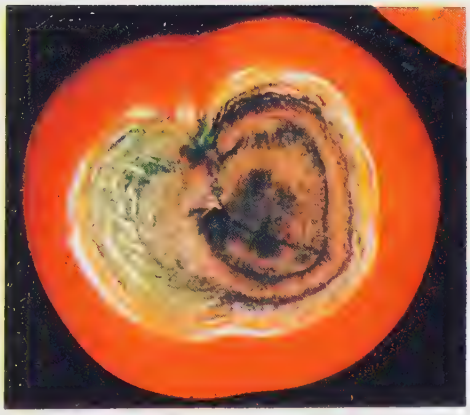
Blossom end rot: this is a condition in which a round, sunken, dark brown or black patch appears on the fruit at the blossom end. It is not caused by a disease but by a severe shortage of water when the fruit is swelling. It can be prevented by regular and adequate watering.

Virus diseases: a good many virus diseases for which there is no cure can attack tomatoes. Remove any diseased plants immediately. Spotted wilt is the most serious, as it spreads rapidly and can destroy a crop. The young top leaves turn brown, and concentric rings appear on them. The plant stops growing. Thrips spread the disease, especially in the greenhouse, so control these by spraying with malathion, if seen.

Mosaic virus shows as pale green or yellow mottling on the leaves, together with curling and distortion. The fruits will be affected only in severe cases and will show no symptoms.

Yellow mosaic is more serious but rarely seen, with both fruit and leaves mottled with yellow patches. Diseased plants should be dug up and burned.

Enation mosaic is a commonly seen virus trouble, in which the leaves are so badly distorted as to be reduced to long, thin threads, curled and twisted, mainly near the top of the plant. Choose virus-resistant varieties to avoid.



Ministry of Agriculture Fisheries and Food

▲ *Hard scabs on the fruits produced by severe blossom end rot.*

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▲ *Mottled leaves on a plant suffering from mosaic virus disease.*

Brian Furner

▲ *Jubilee*

Brian Furner

▲ *Burpee's VF Hybrid*

Harry Smith

▲ *Burpee's Bigboy*

Brian Furner

▲ *Tiny Tim*

Varieties

Better Boy: (VFN), a standard, large-fruited hybrid, disease- and eelworm-resistant; fruits average 1 lb (450 g).

Burpee's Bigboy: an equally large and heavy producer; deeply oblate, thick-walled and meaty.

Caro-Red: a good cropper which contains approximately ten times the vitamin A found in standard varieties.

Early Wonder: large and heavy-yielding for an early tomato; mild and meaty; plants medium-small, plant closer.

Giant Beefsteak: bears mild, flat fruits of tremendous size, though remarkably well shaped for so large.

Golden Boy: beautiful large-fruited yellow; fruits round, smooth, meaty and low-acid; does well in warm areas.

Italian Canner: excellent for pizzas and tomato paste; fruits oblong, dry, mealy with skins that peel off easily.

Manalucie: a late-maturing sort with round, thick-meated deep scarlet fruits of good flavor; resists fusarium wilt, gray leaf spot and leafmold.

Michigan-Ohio Forcing Hybrid: large plants need more room in greenhouse but yield heavily; bear large fruits.

Ohio-Indiana Hybrid: vigorous, continuous blooming and fruiting greenhouse sort; fruits large, pink, globular; resists leafmold.

Orange Queen: bears bright orange, moderate-sized beefsteak-type fruits; low acid; bears early and well.
Ohio WR 25 Pink Forcing: an outstanding, wilt-resistant pink variety for greenhouse culture; fruits good size, firm.
Ottawa 78: compact plants with good foliage cover; fruits moderate size, small core; good on clayey soils; tolerates verticillium wilt, end rot and cracking.
Park's Whopper: (VFN), bears large firm delicious fruits over a long season; prolific; good in Southeast.
Patio Hybrid: developed especially for home gardeners; strong, bushy plants produce moderate crops of fair-sized round fruits; ideal for barrel and tub planting.
Ponderosa: often called the Pink Beefsteak; produces large flattish meaty fruits; low acid; an old favorite.
Rocket: one of the earliest varieties; small plants with smallish but tasty fruits; good for tub culture.
Roma: fruits plum-shaped, solid, meaty and mild; ideal for tomato paste or canning whole; resists fusarium wilt.
Stakeless: late, low, suitable for tub and patio culture; fruits surprisingly large beefsteaklike; resists sunscald and fusarium wilt.
Stokesalaska: early, bushy; produces 50–60 small deep red fruits.
Stokes Early Hybrid: a good staking variety; bears good quantity of medium-sized fruits; maintains even size through season.
Sunray: medium-sized, orange, late; globular fruits with low acid content; good quality; fusarium-resistant.
Tiny Tim: possibly the earliest of all; ideal size for whole fruits in salads; plants are tiny.
Trip-L-Crop: very large fruits; can be grown as a climber—to 20 ft (6 m); extremely prolific.
Tropic: good for spring or fall in greenhouse; resists tobacco mosaic, leafmold, verticillium and fusarium wilt.
Tuckcross 520: large-fruited greenhouse type with smallish deeply oblate fruits; fusarium and leafmold-resistant.

Pat Brindley

▲ *Plum-type tomatoes.*

A-Z Collection

▲ *A commercial globe sort.*

Ultra Girl: (VFN), one of very best early staking hybrids; fruits very firm, large, without green shoulders; crack-resisting.
Veeset: firm-fruited, crack-resisting; of moderate size fruit; disease tolerant; lends itself to direct seeding in the garden.
Vendor: probably the best fall staking or greenhouse tomato; globe-shaped, crack-resistant, prolific; resists tobacco mosaic and leafmold.
Yellow Pear: cluster-fruiting; late, mild, flavorful; use fresh, preserved, pickled.
Yellowing Plum: sweet, deliciously flavored; good for salads and preserves; late as Yellow Pear.
Note: VFN means resistant to verticillium wilt, fusarium wilt and nematodes.

step-by-step growing guide

Turnips

Brassica rapa (fam. *Cruciferae*)
Hardy biennial
Sowing to harvesting time: 4–7 weeks
Size: roots 1½–4 in (3.8–10 cm); leaves to 18 in (45 cm) long
Yield: roots average 3–8 oz (90–240 g)

Turnips are quick and easy to grow, and their swollen white roots provide a delicate flavor when used in stews or casseroles, or served on their own as a vegetable. Although often thought of as an autumn and winter crop, turnips are much more versatile. By planting early to suit the season, and by meeting their few cultivation needs, you can extend cropping over many months.

In the annual garden cycle, turnips can be regarded as three distinct crops. Early turnips are those which are ready to harvest as quite small roots. Because they are so quick growing, they make excellent catch crops.

Maincrop turnips are sown in late spring or early summer to produce roots 3–4 in (7.5–10 cm) in diameter in autumn. In mild areas they can be lifted as needed through the winter; in colder areas they are lifted all at once in autumn and stored.

You can also grow turnips in spring or autumn for their leaves, which are cooked like cabbage and are rich in vitamin C and iron. The leaves can either be harvested as thinnings, before the roots have fully formed, or the roots can be left in the ground over winter to produce a continuous supply of spring greens and roots.

Suitable site and soil

Turnips require an open, sunny position. If grown in the shade of trees, they will produce foliage rather than roots. For early turnips, the site benefits from some shelter from north and east winds.

Although turnips will grow on a wide variety of soils, the main requirement is that the soil is moisture retentive; rich sandy loams are ideal. Turnips like calcium and are grown extensively on limestone soils; they also need a soil well supplied with phosphates.

Turnips grow best on a soil which has been manured for a previous crop, such as potatoes. If the site has not been previously prepared, dig the soil over in autumn or early winter. If it is dry or heavy, dig in plenty of well-rotted manure or compost to improve moisture retention and drainage. If you are digging in manure, bury it deeply. Unless the soil is limy, apply a top dressing of agricultural lime to insure that the soil is neutral.

R. J. Corbin

▲ *Turnips are one of the easiest vegetables to grow; both leaves and roots are edible.*

Sowing

In theory, the gardener can grow a succession of crops from early spring until late autumn. Two crops are more practical, an early one harvested in early summer, and a maincrop harvested in autumn and stored through the winter. An intermediate crop would coincide with the main summer vegetables, and any seed sown in late spring for harvesting in summer might bolt under hot, dry weather conditions.

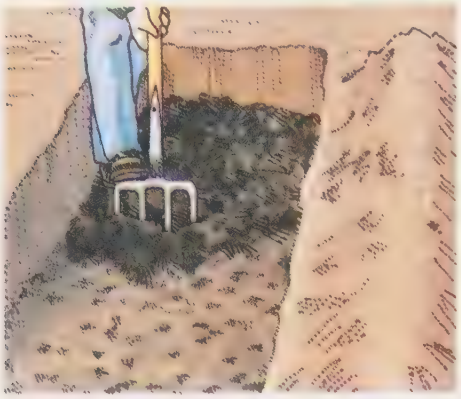
For the first sowing, choose an early, quick growing variety and plant in early spring. For maincrop turnips, sow in mid- to late summer, again selecting a suitable variety. A final sowing in early autumn will provide turnip tops in spring, with a cutting, if required, in late autumn within a few weeks of sowing.

The early varieties generally have white roots. A succession is provided by more white varieties and by white turnips with red or purple tops.

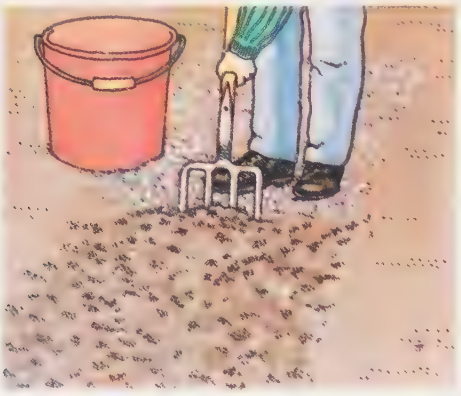
Sow the seeds thinly, ½ in (1.3 cm) deep, in drills 12–16 in (30–40 cm) apart; ¼ oz (7 g) of seed is enough to sow a 30 ft (9 m) row; if you have more seed than you need, you can store it; the seed remains viable for three years.

As soon as they are large enough to handle, thin the seedlings to a distance of 2 in (5 cm) apart. Pairs of seedlings occasionally grow very close together and appear as one seedling, so thin carefully. Thin early crops and turnips grown for greens to a final spacing of 6 in (15 cm) between plants. Turnips grown as maincrop should be thinned to a distance of 9–12 in (23–30 cm) apart. If you spread

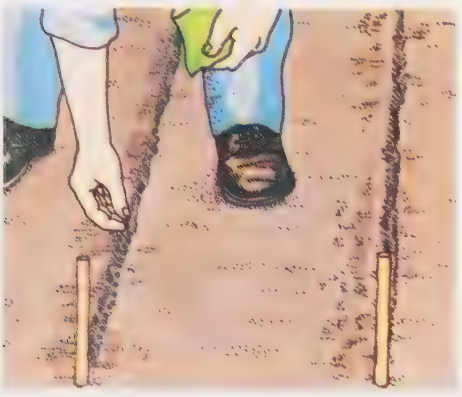
PREPARATION AND PLANTING



1. Begin digging the soil in autumn or early spring; work in plenty of well-rotted manure or garden compost.



2. Unless your soil is limy, apply a top dressing of agricultural lime to make the soil neutral in pH.



3. Sow the seeds thinly, ½ in (1.3 cm) deep, in drills 12–16 in (30–40 cm) apart; any extra seed can be stored for later use.

the second thinning over a period of several weeks, you can use the thinnings as spring greens. The sowing to germinating period varies according to soil warmth, but in reasonably warm weather germination is rapid and can take less than a week. Like most other root crops, turnips do not transplant well.

Cultivation and care

The cultivation needs of turnips are moderate and fairly basic. For early sowing in the open, protect the plants with plastic covers if the weather turns cold. Turnip seedlings are particularly vulnerable to attack by flea beetles, so dust the drills with rotenone as soon as the seedlings emerge and continue dusting or spraying with rotenone or Sevin as necessary.

Spring turnips should be grown as quickly as possible, without any checks. This means there must be a constant and steady supply of water. If the turnips grow in dry soil, they may either run to seed without forming roots or else the roots may be coarse, stringy and unpleasant. On the other hand, if the turnips are watered heavily following a long dry spell, their roots may split.

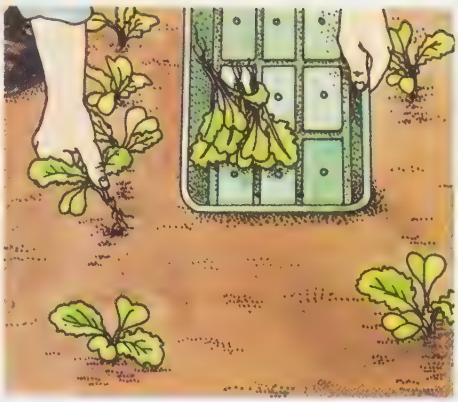
Keep the soil well hoed, being careful not to damage the roots. This helps to control weeds and also keeps the soil aerated. It is important to keep turnips—along with other root crops—free of weeds in order to allow the roots to develop normally. Weed growth can be discouraged by applying a light mulch around the plants. This will also help keep the soil from drying out.

Harvesting and aftercare

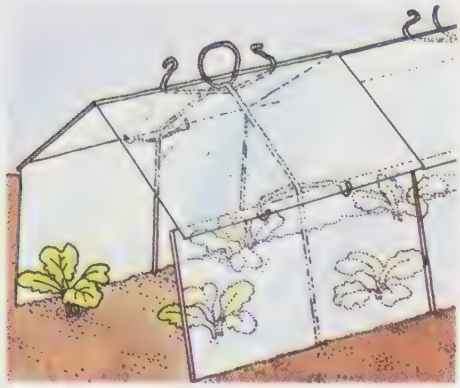
Turnips are best when grown quickly and harvested while still young and tender. Pull spring turnips when they are about the size of a tennis ball, and cut the leaves off close to the root. The spring crop of leaves may be picked or cut at any time after they are about 4–6 in (10–15 cm) high. Some of the turnip varieties which are grown for pulling when young are not frost-hardy, and if

CARE AND CULTIVATION

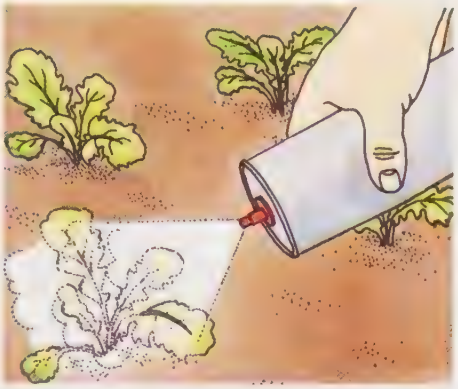
1. The first thinning takes place when the seedlings are large enough to handle; thin to 2 in (5 cm) apart.



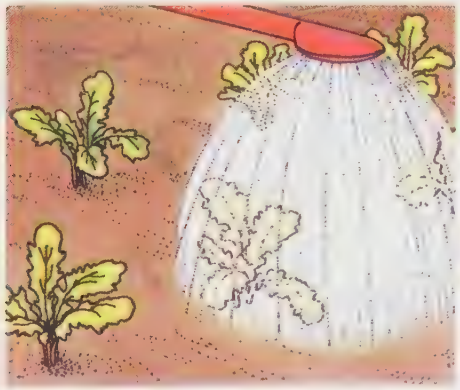
2. Thin again to 6 in (15 cm) apart for early crops and those for greens; space maincrops 9–12 in (23–30 cm) apart.



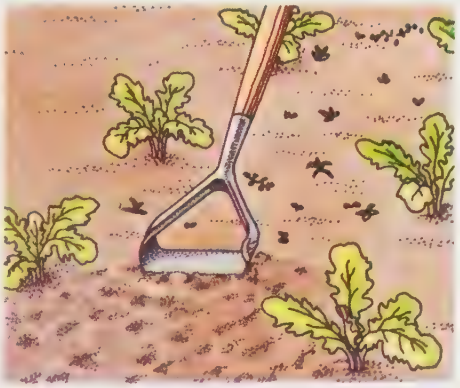
3. For early sowing in open ground, protect the plants if the weather turns cold or frost threatens.



4. Dust the young plants with rotenone or Sevin as a precaution against turnip flea beetle; reapply as necessary.

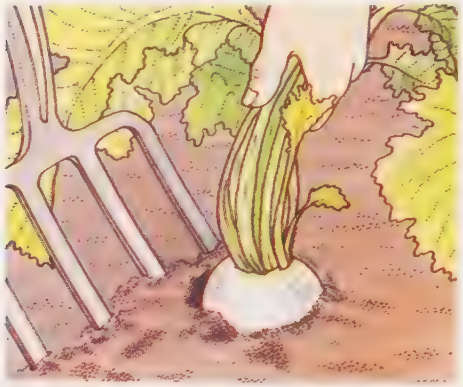


5. The turnips should receive a steady supply of water while growing, or they may bolt without forming roots.



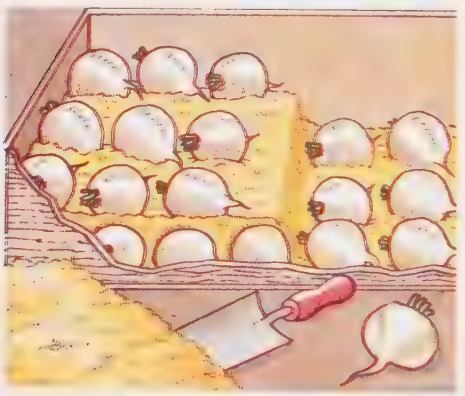
6. Keep the soil well hoed, being careful not to damage the roots; this controls weeds and keeps soil aerated.

HARVESTING AND STORING



1. Pick early turnips when they are the size of a tennis ball; maincrops can be left in the ground until needed.

2. Pull turnip tops when they are 6 in (15 cm) high; do not pull more than two leaves from a plant at one time.



3. In cold areas, lift maincrops in late autumn for storing; place roots in boxes between layers of dry peat or sand.

you make a late sowing, these should be out of the ground before the onset of hard frost.

Hardier winter varieties can withstand a moderately mild winter. Alternatively, if you live in a cold, wet area, or where the ground is likely to be frozen hard, lift the turnips for storage in clamps or boxes until needed. Begin harvesting for storing when the outer leaves show signs of ripening in late autumn; leave about 1 in (2.5 cm) of leaf stalk attached to the roots. If storing them in a box, pack the roots between layers of dry peat or sand, and store in a cool place where they will keep until early spring.

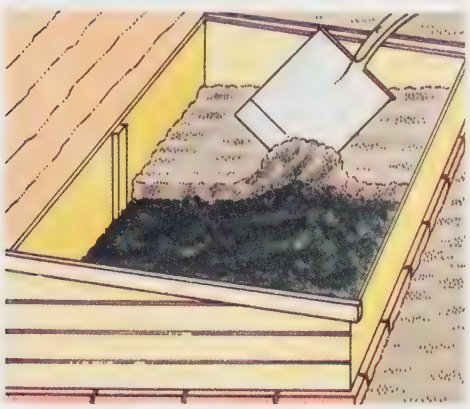
Lift the roots systematically for immediate use or storing; do not pull the biggest ones first. In this way you will have a feasible area of cleared ground to dig over before planting the next crop; any turnips left in the ground for spring greens will be grouped in one place. These spring greens will be particularly useful at a time of the year when cabbages are scarce. Do not pick all the leaves off one plant, or it will stop producing new growth. Pick just one or two leaves from each one, so the plants will continue producing fresh foliage. As soon as the plants form flower heads, however, scrap them, as the leaves will be bitter and unpleasant tasting.

To avoid pests and diseases, clear away all surplus roots and the remains of vegetation after harvesting and take them to the compost heap. If you have had serious trouble with pests or diseases, do not risk spreading them through the compost heap; dig up and burn all debris instead.

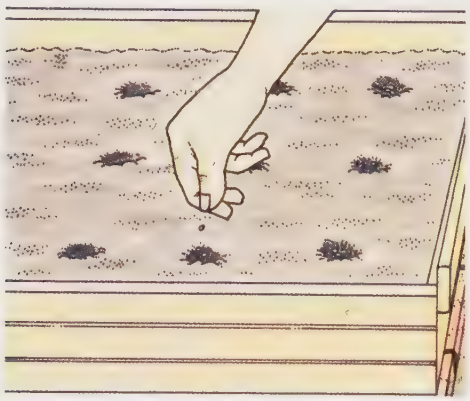
Growing turnips under glass

Turnips may be produced very early in the season if you grow them under glass. They will not stand hard forcing, however, so if you grow them in a frame on a hotbed use gentle bottom heat only. Insert the seeds, two or three together, in holes about 5 in (12.5 cm) apart in late winter or early spring, as your climate permits. Thin to one seedling per hole when the seedlings are large enough to

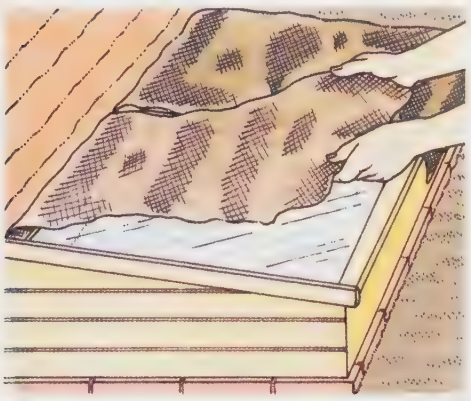
GROWING UNDER GLASS



1. For growing in a frame on a hotbed use gentle heat only; cover a layer of leaf litter with fine soil.



2. Insert seeds, in groups of two or three, in holes 5–6 (12.5–15 cm) apart, in late winter or early spring.



3. Cover the glass with sacks or mats to help retain heat until seeds have germinated; then remove the sacks.

handle. The bed should be covered by sacks or mats to help retain the heat until the seeds have germinated; remove the sacks once the seedlings appear. Allow plenty of air to circulate around the plants after this, and water every day. It should be possible to harvest the crop within four to eight weeks of sowing.

Alternatively, if you want early turnips without using a hotbed, you can grow them under plastic covers in early spring. Keep them covered and thin the seedlings so they are 6 in (15 cm) apart. You should have tender roots for pulling in about six weeks. Turnips left in the soil over the winter to produce spring greens may also need protection if the weather turns very cold.

Exhibition tips

It is risky to try to time a single sowing of turnips to be ready for a show date, because unforeseen changes in weather can retard or advance the growth considerably. Make several small sowings before the show, and select the best roots for exhibition. Six turnips is the usual number shown in single dishes, and ten turnips in a collection of vegetables.

The globe turnips should be a little larger than a tennis ball, and as uniform in size, weight, and general appearance as possible. Globe varieties should be perfectly round, without any taper to the taproot. Long varieties should be 1½ in (3.8 cm) in diameter, and 5–6 in (12.5–15 cm) long. For all varieties, the judges will look for clear skins and symmetrical solid roots, with small taproots.

Lift the roots carefully with a fork and put them in wet sacking so they do not dry out. Wash any soil off carefully with cold water and a sponge; do not scrub them or the skin may be damaged. Remove the small outer leaf stems entirely, and cut the leaves away so that 5 in (12.5 cm) of leaf stem remains. Trim away any small root hairs from the taproot with a sharp knife.

The roots can be displayed in a circular basket, on a flat plate or board, or hung from wire cones; try to make the display pleasing and attractive.

A-Z Collection

▲ *Turnip leaves are rich in vitamin C and iron; cook them as you would spring greens.*

Storage
Turnips may be stored in an outdoor pit or cellar in temperatures of 32–40° F (0–4.4° C) and need high humidity. Do not store in a basement as they give off an odor. Turnips peeled, cubed and heated for two minutes in boiling water can be stored in your freezer.

Varieties

Amber Globe: yellow-fleshed; for fall planting. Later than Purple-top White Globe.

Early Purple-top Milan: white, tender; delicately flavored when young. Flattened globe.

Cow Horn: late, carrot-shaped, long; half out of ground, easy harvesting.

Foliage (Shogoin): grown for both greens and roots; semiglobe, white flesh, mild.

Just Right: moderately late; grown for tops and roots. Fairly large, flattened globe.

Purple-top Strap Leaf: very early, productive; flat, fairly large, white flesh.

Purple-top White Globe: white-fleshed, round; leaves cut, dark. A favorite.

White Egg: popular in South; egg-shaped or half-long, partly above ground.

Seven Top: roots tough, grown in South as winter greens.

Tokyo Cross: All-America winner; white, smooth. Semiglobe; tender large or small. Very disease-resistant.

Other varieties

Early Six Weeks (Early White Stone): fast, first class white globe turnip; early cropper abroad; sweet flavored; good for growing under glass.

Jersey Navet: cylindrical shaped, white fleshed English variety; excellent for cold frames for early crops, or can be sown in open for maincrops.

Golden Perfection: another English variety; nearly flat golden skinned roots, small to medium sized; tender flesh.

White Milan: very early English turnip, excellent for growing under frames; dwarf, compact roots, flat shaped and medium sized.

Red Globe: round, medium sized roots; white flesh, red and white skin; grown abroad.

Golden Ball: dwarf and compact; tender yellow flesh; hardier than white-fleshed turnips and lasts well in open; best variety for autumn sowing in England; flavor only moderate.

Brian Furner

▲ *Cow Horn*

Brian Furner

▲ *Purple-top Strap Leaf*

Brian Furner

▲ *Early Purple-top Milan*

Pat Brindley

▲ *Purple-top White Globe*

Harry Smith

▲ *Tokyo Cross*

Pat Brindley

▲ *Green-top White are grown abroad.*

Snowball: early British variety, quick growing; well-formed, round white roots; can be cooked or grated raw; suitable for table and exhibition work.

Green-top White: round British variety, with half green, half white skin; leaves used as spring greens; heavy cropper; well-flavored roots.

Manchester Market: excellent green-topped, English globe variety; mild flavor; especially recommended for winter use as a table variety.

Pests & Diseases

Club root disease: this is one of the most serious fungal diseases affecting members of the *Cruciferae* family, mainly brassicas; turnip crops can be completely destroyed by severe infections of club root. Yellow fleshed varieties have slightly more resistance to club root than white fleshed varieties. The above-ground symptoms are stunted and weak plants with wilted grayish leaves. The roots, when dug up, will appear gnarled and galled, slimy, foul-smelling and rotten. Once a soil is infected with club root, it is a lengthy process to eradicate the fungus completely; it is better to try to prevent an attack of club root than to cure it. Because club root is associated with acid soils, be sure that the ground is not too acid before sowing. Correct any drainage problems at this time as well, as plants grown on waterlogged soil are particularly vulnerable. To protect seedlings, sprinkle an approved fungicide dust, used according to manufacturer's instructions, in the seed drills before sowing.

Make sure you practice crop rotation, and do not grow turnips on land which has grown any brassicas in the last two years. Finally, dig up and burn any infected plants as soon as you see them; do not put them on the compost heap or the infection could spread. Soil may be sterilized with a recommended fumigant.

Powdery mildew: this mildew is most likely to occur in dry summers. The symptoms are white powdery patches on the leaves. The best precaution is to make sure your plants do not run short of water in dry spells. If powdery mildew does appear, pick off and burn infected leaves and spray the remaining leaves with an approved fungicide.

Dry rot: although rutabagas are usually more vulnerable to dry rot than turnips, the latter are sometimes infected. The symptoms of dry rot are brown, sunken, cankerlike areas on the roots. Prevention

Shell Photo Library

▲ *Leaf shows damage done by flea beetle; a severe case may be skeletonized.*

George Hyde

▲ *Wounds made on the leaves and roots by slugs allow infections like soft rot to attack.*

is again the best method of controlling the infection. Keep your garden free of slugs and snails, as they cause the wounds through which dry rot enters the roots. Avoid using manures or composts containing pieces of infected roots or leaves. Destroy any infected roots immediately.

Soft rot: this bacterial infection causes brown or gray mottling and eventual softness in the inner root, although the outer skin may remain firm. As with dry rot, the infection usually enters the root through a wound, perhaps from hoe or insect damage. It is also likely to occur where the roots are stored in damp conditions. Dig up and destroy any infected plants, make sure your garden is pest-free, and avoid hoeing. Too heavy liming can predispose plants to this trouble, so try to avoid this condition.

Brown heart: the symptoms of this physiological disorder, which is due to boron deficiency, do not appear until the turnip roots are cut open. The plants will show gray or brown areas in the bottom half of the root; the flesh will be bitter, stringy and unpleasant to eat. Brown heart is sometimes associated with very dry soil conditions; if your soil is very free draining, make sure you dig in enough humus when preparing the site to make the soil moisture retentive. Excessive liming can also cause brown heart, as it makes the boron in the soil unavailable to the plants. Mulching the soil with well-rooted compost and digging in manure is the safest method of correcting this deficiency, along with a light soil dusting with borax.

GUIDE TO TURNIP TROUBLES

Symptom	*Probable cause*
Wilted gray leaves, roots misshapen, slimy and rotten	Club root
Brown, sunken, cankerlike areas on roots	Dry rot
Brown or gray mottling in inner root	Soft rot
White powdery patches on leaves	Powdery mildew
Gray or brown areas in bottom half of root	Brown heart
Pale gray patches on undersides of leaves	Downy mildew
Small round holes in leaves	Flea beetle
Leaves and roots eaten	Slugs and snails
Tunnels in roots	Wireworm
Tunnels in stem below ground	Cabbage maggot
Colonies of small insects on new growth	Aphids

Murphy Chemical Co.

George Hyde

Wireworm: this pest is most troublesome on soil freshly turned over from grass.

Brown, hardened and shrivelled stems caused by fungi; plants won't crop well.

Downy mildew: the first sign of this infection is the appearance of grayish white patches on the undersurfaces of the leaves; seedlings are most likely to be infected. Eventually infected leaves wilt, turn yellow and die. Remove and destroy infected leaves, and spray the remainder with an approved control.

Flea beetle: this is the most serious pest you are likely to encounter with turnip crops. The most severe attacks occur in hot dry weather, when the plants may be entirely defoliated. The main symptom is small round holes in the leaves; eventually the holes may join up and the leaf become skeletonized. As a precaution, dust the seedlings as soon as they appear with rotenone or Sevin and repeat if you see holes in the leaves.

Wireworms: these shiny yellow-to-brown worms are likely to be a problem only on soil freshly turned over after grass; land that has been cultivated for any length of time is usually free from wireworms. The symptoms of wireworm attacks are tunnels through turnip roots. Sevin dust raked in before sowing will help to minimize the attacks.

Slugs and snails: besides damaging turnip crops by feeding on the leaves and roots, the open wounds they make allow more serious secondary infections, such as soft rot and dry rot, to attack the plant. Keep your garden free from debris and litter where slugs and snails can hide during the day. You can control them with a proprietary slug bait used according to manufacturer's instructions.

Cabbage maggot: primarily a northern pest, the small fly lays eggs at or near the bases of the stems. Upon hatching, the maggots riddle the stems with tunnels just under the surface of the soil. To control it, it is necessary to control the pest on all members of the cabbage family. Cover seedbeds with cheesecloth and place tarpaper squares around the stems of the seedlings at ground level. When sowing, also dust the furrows with a control permitted by your state authorities.

Aphids: these also attack turnips. You are most likely to find them feasting on the undersides of the leaves, so check there regularly when you are tending your garden. A strong stream of water from a hose will wash them away. Or kill them with a spray of Sevin or rotenone as needed. If you do find it necessary to use an insecticide, be sure to follow the instructions on the label relative to timing of harvesting.

growing ideas

A No-waste Vegetable

Grow this economical vegetable in a shady garden corner. The delicious roots are used like carrots or parsnips and the foliage can be substituted for parsley.

Turnip-rooted parsley (also known as Hamburg parsley) is grown for its thick, off-white, parsniplike roots, which have a taste somewhere between celeriac and parsnip. They can be eaten raw in salads or cooked like carrots, parsnips or other root vegetables. It is a very economical vegetable because the entire plant is used. The foliage can be cut and used wherever you would use ordinary parsley.

Turnip-rooted parsley can tolerate a good deal of shade, so it is a useful plant to grow in that shady spot where other crops will not thrive. Choose a situation which gets shade for most of the day.

The plant likes a fairly rich soil. Ideally, the soil should have been manured for a previous crop. Failing this, work in well-rotted garden compost or a complete fertilizer at the rate of 4 oz per sq yd (120 g per sq m) prior to sowing. Never use fresh manure, as it may cause rotting. Just before sowing, dig the soil thoroughly and remove all stones.

Turnip-rooted parsley is grown from seeds. Sow some in early spring, in drills ½ in (1.3 cm) deep and 1 ft (30 cm) apart. If you sow thinly, it will mean less thinning later on. You can make another sowing in early summer if you want to have roots the following spring.

Harry Smith

←Turnip-rooted parsley can be left in the ground over the winter. Cut the dark green foliage as you need it, and use it in any dish where you might use parsley.

As long as the weather is warm, the seeds should germinate in about 10–14 days. However, the process can be very slow, sometimes taking up to several weeks. It is a good idea to sow lettuce or radishes between the drills of turnip-rooted parsley. This will mark their position, and it will also make maximum use of the land.

When the seedlings are large enough to handle, thin them to a final spacing of about 9 in (23 cm) apart. Turnip-rooted parsley is a slow-growing crop which re-

Sow lettuce as a catch crop to mark the rows.

quires only a minimum amount of care. As long as the plot is kept weed-free and the plants have plenty of water in dry weather, they should grow well without a check. The crop has the additional advantage of being virtually without any pests or diseases.

Turnip-rooted parsley takes a long time to mature; up to nine months in most climates. You can cut some of the foliage for salads or flavoring in early summer; just cut close to the ground. Be sure to leave some foliage for cutting in winter, when other herbs will be scarce. The root crop will not be mature until late autumn or early winter at the earliest. Harvest when the roots are fully grown—at least 7–8 in (17.5–20 cm) long. In contrast to those of other root vegetables, the largest roots are the tastiest.

To harvest turnip-rooted parsley, dig up the roots as you need them. The foliage may remain throughout the winter and can also be cut as needed.

If you think that the ground may become too frozen to dig up the roots, lift

Cut the foliage starting from the outside.

them all in late autumn and store them as you would parsnips, in wooden boxes layered in sand. Do not store any bruised or damaged roots. The foliage can be cut, tied in bunches, and dried like regular parsley. You can also mulch the rows

Lifting the crop

with 1 ft (30 cm) or more of leaves to keep the ground unfrozen.

If you made a sowing in summer, the crops can be left in the ground to overwinter. The roots should be ready for digging in late winter or early spring.

Turnip-rooted parsley is a biennial plant, and when the top growth begins to lengthen in midspring, it is preparing to flower and its useful life is over.

growing ideas

Water-loving Salad Vegetable

A delicious and popular salad vegetable, watercress is an interesting crop for the ambitious gardener who wants to try growing something really different.

Watercress (*Nasturtium officinale*) is a hardy annual which is grown for its leaves, usually eaten raw in salads. The leaves have a rather pungent and peppery flavor, and they are an excellent source of vitamins. They also contain a fair amount of protein, making them a particularly good salad vegetable.

Although recognized as a useful and delicious vegetable for quite a long time, watercress has been a cultivated crop for less than a hundred years. Previously it was simply gathered from shallow streams, where it grows naturally. You can still find watercress growing in the wild, but you will be assured of better

Watercress growing in a stream; a constant supply of fresh water is needed for this crop.

R. J. Corbin

crops if you are willing to take the time and trouble to grow your own.

There are two types of watercress—green and brown. Green watercress is best for summer crops. It remains green until autumn, but is damaged by frost. Brown watercress (*N. microphyllum x officinale*), on the other hand, will bear some degree of frost, thus making it ideal for winter and spring crops. Its leaves turn purplish-brown in autumn, but they are still good to eat. Both varieties of cress are cultivated in the same way.

As the name implies, watercress needs a great deal of water to grow. The roots must be in water, but the plant need not be totally immersed. However, you must be extremely careful about the water you plant it in, as a polluted water source will produce inedible, useless crops. Never plant watercress in a garden pool, which can be stagnant; the plants will not survive in stagnant water.

If you are lucky enough to have a clean natural stream in or near your garden, you can sow your seed along the bank, about 6 in (15 cm) above the water line. The site should have partial shade, if possible.

Most gardeners will not have access to a stream, so it then becomes necessary to prepare a special bed in which to grow watercress. Select a site which is in partial shade but is free from overhanging trees, as falling leaves or blossoms will not do your cress any good. Despite the old myth that you must have permanently running water to grow good watercress, this is not so, but the site must be always moist, and you must be willing to water the bed daily. For this reason, a site close to a garden standpipe or within easy reach of a hose is essential.

To prepare a bed, usually done in early spring, mark out a site about 1 sq yd (1 sq m) in area, which will be sufficient space to supply the average family with watercress. Dig the soil very deeply, and at the same time mix in sufficient peat or other organic material to make the ground rich and moisture-retentive, but not waterlogged. The surface of the bed should be about 1 in (2.5 cm) or so below the surface of the surrounding soil.

After the bed is dug, firm the surface and rake it over to make it level. Then flood it with fresh water, filling it up to the level of the surrounding soil. When the water has drained away, you are ready to sow your seed. Start off with a midspring sowing of the green type—you should be able to obtain the seed from a good garden center or seed merchant. Sow the seed thinly broadcast; do not cover it with soil. When the weather is warm, germination is quick and you should be able to start taking single leaves from plants within about two or three weeks of sowing. As the plants grow and get well established, you can either take off individual sprigs or, in the

sowing seeds in a prepared bed

Water-loving Salad Vegetable 733

early stages, remove plants completely so that the remainder have more room in which to grow.

Once a bed is started, it will require frequent watering to keep it growing. A trickle irrigation system is a particularly good idea, especially in a dry summer, otherwise you will have to water daily, preferably by garden hose, using a gentle pressure, and flooding the bed each time. Be sure that the water continues to drain, as the plants will not survive in a waterlogged or stagnant bed. Keep a lookout for any weeds and remove them. Since watercress grows naturally in water, trickle irrigation will give the best results if you do not have a stream in the garden.

If you cannot obtain watercress seed, then you can use watercress bought in a supermarket as cuttings for planting. Obtain the shoots as newly cut as possible. They may already have some roots; if not, stand them in a glass of water at atmospheric temperature and they will root in a day or two. To plant, strip the leaves from the bottom half of the stem, and then place the cuttings in the bed, about 2 in (5 cm) apart. Bury them in the soil to a depth of 1½ in (3.8 cm). Be sure to keep the bed completely shaded until the cuttings are established. Rooting and establishment will be more certain under warm weather conditions.

Brown watercress for winter and spring use must be grown from cuttings, as seed is very rarely available. Plant your bed with these cuttings in late summer, and you should enjoy supplies throughout the winter and spring.

Be sure to protect the green watercress bed with a frame in frosty weather, or your plants may be frozen and die down. This cress tends to sink below the surface of the water in which it is growing in cold weather, as the water temperature is warmer than the air, but it can still be cut.

Watercress of both types should always be cut with scissors, never pulled, as the whole plant is likely to come up rather than the leaves or few sprigs required. Do not cut too far down the stem, which will then continue to produce new shoots for cutting.

Watercress beds can be kept cropping for several years in succession, but the plants tend to deteriorate from constant cutting and decrease of food supply. Also, the drainage deteriorates, so it is better to prepare a new bed in a different part of the garden every two or three years.

If you do not wish to go to the work of preparing a special bed, watercress can sometimes be grown in shallow pots or clay pans standing in containers of fresh water. Fill the pots with a good quality, moisture-retentive potting mixture to a depth of 3 in (7.5 cm) and sow the seed broadcast. Keep the containers in a shady spot on balcony or patio, or on a shady windowsill, and remember to keep them supplied with plenty of fresh water.

watercress growing in a shallow pot indoors.

Glossary

Annual An annual is a plant which completes its life cycle (germination, flowering, setting seeds) within one growing season and then dies. This does not necessarily mean within a calendar year; an annual can be sown in early autumn and will complete its life cycle the following summer. Nor does the cycle always last as long as one year; some annuals, mainly weeds, go through several life cycles in the course of a single year. Annuals are subdivided into three main groups: hardy annuals, half-hardy annuals and tender annuals. These classifications are rather vague, basically they refer to the plant's degree of resistance to frost and ability to grow outside unprotected.

Axil In gardening, the term axil refers to the angle formed between the leaf stem and the parent stem of a plant. Sometimes this angle contains a leaf bud or a flower bud, known as the axillary bud. For certain crops you may need to 'pinch out' some or all of these buds, or the resulting axillary shoots. This is important in crops such as tomatoes, where the axillary buds are pinched out to stop the production of extra foliage and encourage fruit formation.

Picking out axillary shoot

Biennial A biennial plant is one that takes two full growing seasons to complete its life cycle of germination, flowering, setting seeds and dying. Many vegetables are biennials, but they are treated as annuals; that is, they are harvested in the first year before they have had time to flower and seed.

Blanching Blanching is the process of excluding light from growing plants, to prevent the production of chlorophyll (the coloring matter in the green parts of plants). This is done to certain vegetables to make them white, tender and more delicate in flavor. Leeks, celery and endive are all vegetables which are commonly blanched. The usual method for stem vegetables is to wrap the plant in cardboard, plastic sheeting or newspaper then earth it up. For endive and similar low-growing plants, the best method is to cover each plant with a clay pot, stopping up the drainage hole with putty or other material.

Blanching celery

Blind

A plant is blind when it loses its growing point and ceases to develop, often as a result of damage or disease. This is something to look for in thinning out seedlings, it is common in the cabbage family if seedlings are attacked by cabbage root fly larvae. The plants appear healthy at first sight, but examination will show that the growing point is gone. No treatment can restore growth to blind plants, so dig up and discard them.

Bloom

In the kitchen garden, bloom refers to the downy or white waxy covering on plums, peaches and other fruit, and on such vegetables as eggplants and cucumbers. A 'beautiful bloom' is much prized for the good appearance it gives to fruits and vegetables.

Bleeding

A plant is bleeding when it looses sap from a cut. A bit of bleeding is likely from any cutting, but it is most prevalent in the spring when the sap is rising. For this reason, stone fruit and vines should not be pruned in late spring, as they tend to bleed more than other plants. Bleeding is not harmful and treatment is not required, as healing is usually rapid. Some gardeners prefer to stop flows of sap by searing the cuts with a hot iron, or by painting with a proprietary mixture. Beets will usually bleed if the skin or flesh is damaged, causing a loss of color. To prevent this, be careful not to damage the skins when lifting the beets, and twist off the tops rather than cutting them.

Blotchy ripening

This is the name given to the uneven ripening of tomatoes, caused by potash deficiency. It produces green and yellow patches on the fruit. Adding potash to the soil and giving plenty of water should avoid this condition.

A Guide to Basic Gardening Terms

Bolting

Plants which bolt are those which 'run to seed,' meaning that they flower and produce seed too early. Bolting can be an inherited tendency, and breeders work hard to produce strains which will not bolt. Sometimes weather conditions will produce bolting, particularly in hot, dry summers. Onion sets are often difficult to grow without bolting, although new strains have been bred to eliminate this problem. A check in growth will also occasionally produce bolting.

Bone meal

Bone meal is an organic fertilizer rich in phosphorus and calcium, and containing smaller quantities of nitrogen. It is made from the finely-powdered bones of animals, and it is useful when applied to acid soils. Bone meal is safe, but modern bone meal is not as nutritious as the older kinds.

Bordeaux mixture

One of the very oldest fungicides, Bordeaux mixture takes its name from the vineyards of Bordeaux, where it was developed as a remedy for downy mildew. It is a reasonably effective fungicide against such serious fungus diseases as potato blight, tomato blight and scab diseases of apples and pears. There are several different formulas of Bordeaux mixture which can be used. A standard mixture to make at home is 1 lb (450g) copper sulfate and 1¼ lb (570g) hydrated lime to 10 gal (46 L) water, mixed together and sprayed immediately on the foliage.

Brassica

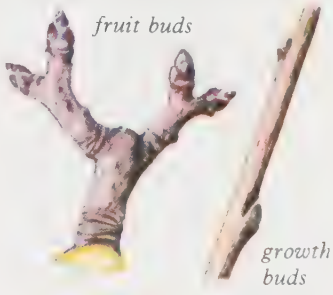
Brassica is a botanical genus to which members of the cabbage family belong. Many varieties of brassicae are available to the gardener, including different types of cabbages, broccoli, Brussels sprouts, kales, cauliflowers and savoys.

Broadcast sowing

This is a method of sowing whereby seed is spread evenly over an area of ground, rather than placed in furrows. The best example is sowing lawn seed, but cabbages, broccoli, Brussels sprouts and other vegetables are sometimes sown broadcast in a bed, for transplanting later. Broadcast seed may be covered by scattering soil over it; or rake the surface and tamp after sowing. One of the drawbacks, compared with sowing in furrows is that weeding tends to be much more of a problem.

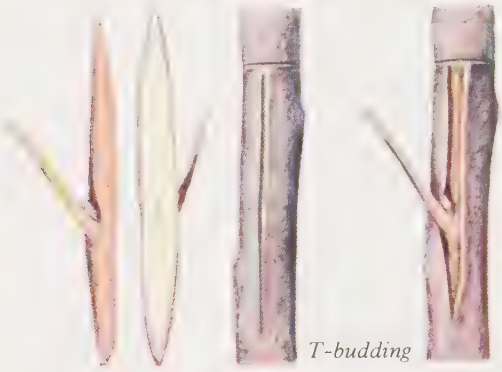
Bud

A bud is an embryo shoot or flower. Buds vary greatly in shape and character, and it is important for the fruit grower to be able to recognize the different types. A knowledge of buds is particularly useful in checking the progress of growth, recognizing if pruning is necessary and when this should be done. The two types that need to be carefully distinguished are the growth or shoot buds, and the blossom buds, which are often referred to as fruit buds. The growth buds are comparatively small and lie closer to the stem than the fruit buds. The fruit buds are larger and more prominent. Other types are the axillary bud, which is found in the axil of a leaf, and the terminal bud, at the tip of a shoot.



Budding

Budding is a method of propagating a fruit tree by uniting a bud, through a slip of attached bark, to a host plant. Most of the fruit trees you order from a nursery will have been created by budding. There are several methods of budding but the most common is shield or T-budding.



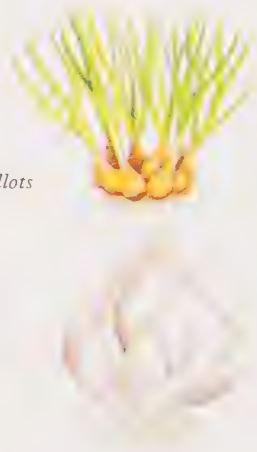
T-budding

To bud a tree, the nurseryman will make a T-shaped slit in the bark or stem of a rootstock and bind into it a growth bud from a chosen variety. He does this by slipping the shield of bark attached to the bud into the slit, and binding the graft with rubber or a plastic strip. This is usually done in midsummer when the tree is in full growth. The bud remains alive but dormant until the following spring. If the bud has taken, the stem of the rootstock is cut back close to the bud in fall, and then cut back entirely after good growth has commenced.

Bulb and Bulbil

A bulb is a swollen underground bud surrounded by plump scales; these are in fact enlarged leaf bases. This bud is attached to a short stem and has roots which die annually. Some bulbs have a surrounding skin of dry papery scales. The bulb acts as a protector for the immature leaves and flowers found in the center. An onion is a good example of a true bulb, and a cross section through an onion clearly reveals the embryo shoots and flower base. Leeks are also bulbs, but elongated and artificially blanched. Sometimes bulbs multiply freely and grow in clusters, as with shallots. Garlic bulbs are made up of several segments called 'cloves' enclosed within the skin of a parent bulb. Cloves should not be confused with bulbils, which are baby bulbs formed on a parent bulb. Bulbils are usually produced on members of the lily family, which botanically is related to the onion group of plants.

cross section of onion bulb



shallots

garlic bulb

Callus

This is a growth of new tissue which forms naturally over a wound on a plant, particularly one made by pruning. When a cut is made, the underlying tissues begin to produce new cells which form a hard 'scab' on the surface to cover the wound. Because a clean wound forms a callus and heals more quickly than a torn one, it is important to trim ragged edges left from pruning. A callus is also produced at the base of root cuttings before new roots can appear.

Captan

A widely used fungicide, captan is particularly effective against scab disease of apples and pears and against gray mold on strawberries. Captan is available both in liquid form for spraying and in powder form for dusting. Although not poisonous to humans, it is highly poisonous to fish and should not be used near a fishpond.

Catch Crop

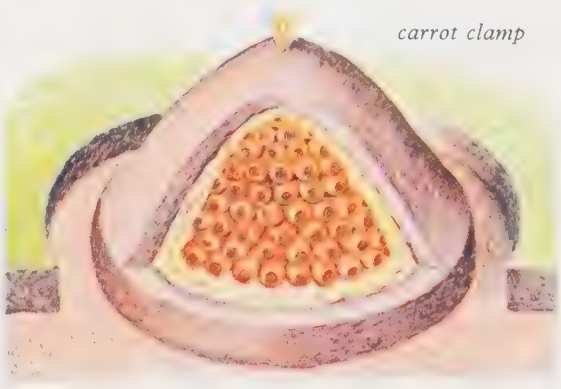
This is a quick-maturing crop which is put into the ground after one crop has been lifted but before the next crop in the rotation plan is planted. For example, lettuces can follow early radishes before spring-sown cabbages are put in, or radishes can go into trenches prepared for celery. Mustard, cress, spinach and spring onions are all quick-growing and make good catch crops.

Chlorosis

This is a physiological disorder which can affect many different plants. The foliage of diseased plants turns yellow because the production of chlorophyll is inhibited. Sometimes the yellowing can be very severe, particularly on fruit trees, and the crop can be lost. Chlorosis is the result of one or more unsuitable conditions in the environment. Cold weather and poor drainage can both be responsible, but the most frequent cause is a deficiency of some essential element in the soil. This can be corrected by changing the mineral balance of the soil.

Clamp

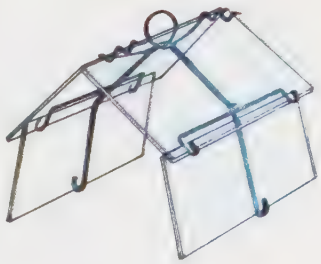
A clamp is an ideal method for storing root crops and tubers out of doors. Only one kind of vegetable should be stored in a single clamp. Choose firm, healthy vegetables and remove any foliage. Make a pile of the vegetables on dry straw; and cover the pile completely with straw. Then pack dry soil over the straw and firm down. Crops stored in a clamp should keep for several months.



carrot clamp

Cloche

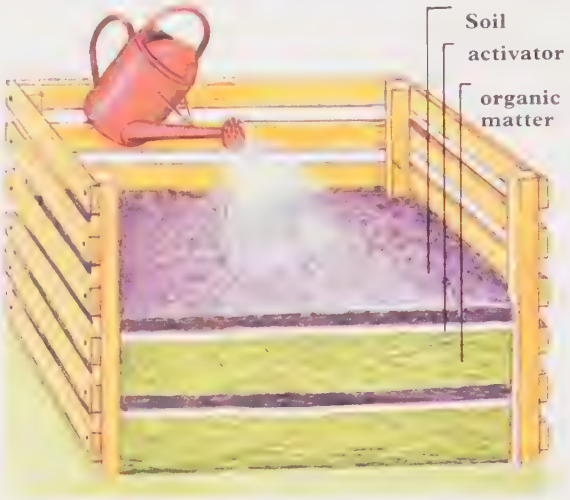
A cloche is a transparent covering used to protect seedlings or plants from low temperatures and cold winds. Some crops, like strawberries or tomatoes, can be raised completely under cloches, but often cloches are used just in the early stages of a plant's life, to allow sowing or planting out rather earlier in the season than would normally be safe. Cloches are available in a wide variety of sizes in some areas. They are made from either sheets of glass supported on a wire frame, from rigid molded plastic, or from plastic sheeting stretched over a flexible wire mesh.



barn cloche

Compost

Garden compost consists of various organic matter allowed to rot down in a compost heap or bin, for use as a substitute for animal manure or as an addition to it. Like manure, it improves and enriches the soil by adding humus and plant nutrients. There are various different systems for making compost; all of them need air, moisture and nitrogen. The compost heap should be constructed so that air can penetrate it, it should be regularly moistened, and small amounts of a nitrogen-containing activator, usually manure or a nitrogenous fertilizer, should also be added.



Compositae

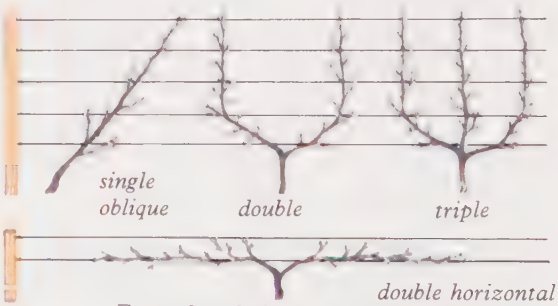
The largest family of flowering plants whose members have flower heads made up of many small individual flowers, or florets. The daisy and dandelion are familiar members of the family; so too are lettuce, endive, cardoon, globe artichoke, Jerusalem artichoke and salsify among vegetables, and tarragon among herbs.

Compound fertilizers

Also known as complete concentrated fertilizers, these contain all the three major nutrients necessary for plant development: nitrogen (N), phosphorus (P) and potassium (K). Some, such as tomato fertilizer, are made to suit particular plants, while others are for general use. It is easiest to buy them ready-made, but they can be mixed at home. It is a legal requirement that the plant food content of a proprietary fertilizer be given on the package, the quantity of each nutrient being expressed as a percentage in the order N, P, K (the plant food ratio). The figures 5:5:10, for example, mean that the fertilizer contains 5% nitrogen, 5% phosphorus and 10% potassium by weight.

Cordon

Cordons are plants which have been pruned and pinched out so that they are restricted to a single main stem, or sometimes to two or three main stems. Fruit trees and bushes are sometimes grown as cordons against fences or walls. A single (oblique) cordon is usually planted at an angle of 45°. Double and triple cordons are usually trained vertically, although a double cordon may be trained horizontally. Cordons take up little room—for example, cordon apples or pears can be planted as close as 2 ft (60 cm) apart—but the trees should be grown on dwarfing rootstocks, otherwise it is difficult to keep them growing as cordons without their fruitfulness disappearing.



Examples of different cordon shapes

Cotyledons

The 'seed leaves' of a plant are known as cotyledons. Many plants have two; the rest, belonging to the group that includes the grasses, have only one (e.g. sweet corn). The cotyledons are usually the first leaves to appear, but in some plants, such as peas, they do not emerge above ground. They usually differ from the 'true' leaves that follow them, generally having a simple, undivided smooth-edged structure. Seedlings are best pricked-out to give them more room when at the seed-leaf stage. It is important to be able to distinguish the seed leaves of your crop plants from those of weeds.

Young cucumber plant

Crop rotation

This is the practice of changing the position of crops each year so that the same crop or group of crops does not occupy the same patch of land for more than one year. This is done partly to make the best use of plant food in the soil—root crops take food from a deeper level than do the cabbage family; some crops prefer fresh manure or fertilizers, others prefer soil that has been manured for a previous crop; legumes (peas and beans) add nitrate to the soil. The other reason for rotating crops is to reduce the build-up of pests and diseases specific to one crop or a group of crops.

Crown

This word has several meanings in horticulture. In relation to growing vegetables it refers to the upper part of a rootstock from which shoots grow. It is often used in a looser sense to refer to the whole of the rootstock, particularly when this is planted to produce a crop, as with asparagus or rhubarb, or when it is lifted for forcing as with rhubarb.

(left) seakale crown ('thong'); (right) asparagus crown

Cruciferae

The Cruciferae are a large family of flowering plants, commonly known as the mustard family from the name of one of its members. The Latin name of the family refers to the cross like (crucifer) arrangement of the four petals. The brassicas (the cabbages and their relatives, including turnips, rutabagas, kohlrabi and mustards) are important members of the family, another is cress.

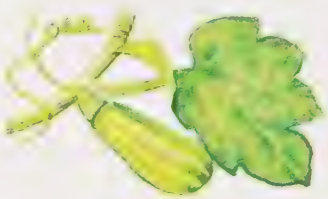
cabbage leaf and flowers

Cross-pollination

The transfer of pollen from one flower to another, usually between plants of the same species, is known as cross-pollination. The male pollen unites with (fertilizes) the female ovules in the flower to form a seed. Self-pollination occurs when the pollen is transferred from the male parts of a flower to the ovules of the same flower. Cross-pollination generally gives more vigorous plants and enables new characteristics to appear, and self-pollination is often actually prevented by the structure of the flower. Cross-pollination is of importance to the gardener in that plant breeders use it to combine the characteristics of two different varieties of a plant to produce a new, improved variety. It is also important in fruit growing; some fruit, such as sweet cherries, blueberries, and some apple, pear and plum varieties, are self-sterile—they crop only poorly or not at all when fertilized with their own pollen, but crop well when cross-pollinated by certain varieties of the same kind of fruit. Some fruits, may even be pollinated by hand to ensure a good crop in a very small space.

Cucurbitaceae

This is a large family of flowering plants, mostly natives of tropical regions, and all frost-tender. Most climb by means of tendrils – thread-like structures that coil spirally around supports. The members of the family are often called cucurbits. Edible cucurbits include cucumbers, gherkins, squashes, pumpkins and melons.

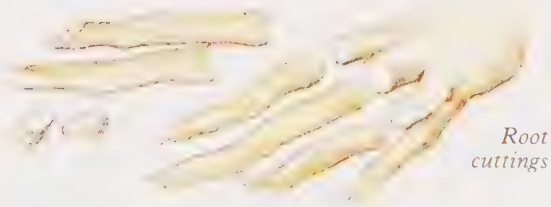


Cultivar

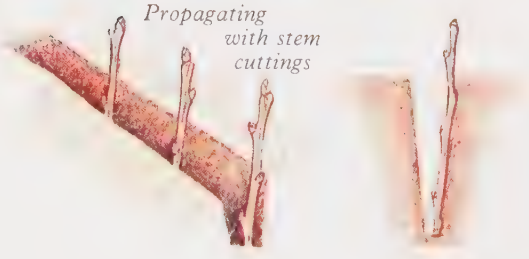
A cultivar is a horticultural variety of a plant, which has arisen as a result of cultivation in a garden, nursery or by deliberate breeding and has maintained its characteristic appearance. Some cultivars can be propagated so that they are true to the parent plant by vegetative means only, and not from seed. In gardening, the term 'variety' is often used to include both cultivars and those varieties that have arisen in the wild.

Cutting

This is a small section of a root, stem or leaf cut off a plant and given the conditions it needs to produce roots and grow into a new plant. Stem cuttings are the most common type. Advantages of using cuttings are that you can propagate a strain or variety of a plant that does not always come true from seed (such as many fruit trees and bushes) and that you can produce new plants quickly. You should take cuttings only from healthy plants; use a very sharp knife and cut them cleanly. Plants propagated from root cuttings include rhubarb and fruit tree rootstocks; those raised from stem cuttings include black currants, red and white currants, gooseberries and blackberries; leaf cuttings are used mainly for propagating ornamental greenhouse plants.



Root cuttings



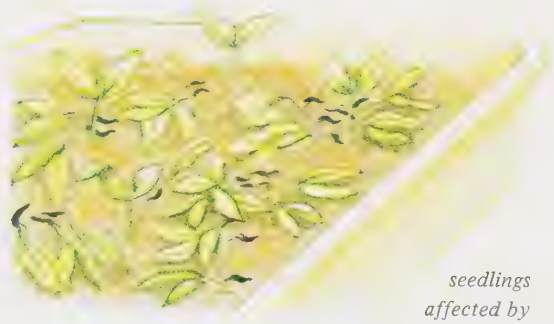
Propagating with stem cuttings

Damping down

The is the operation of soaking the benches and paths in a greenhouse with water, to create and maintain a high air humidity. Damping down is considered necessary for a number of fruit and vegetable crops; cucumber is one example.

Damping-off

This is the popular name given to a group of fungus diseases that attack the base of seedlings, making them rot near soil level and topple over. It is usually a result of using over-wet or unsterilized soils, or of overcrowding, too much humidity in the air or poor drainage. With properly sterilized mixes, sowing thinly and thinning when necessary, it should not occur; as an additional safeguard, you should water the seedlings with an approved fungicide, which controls the disease. If damping-off does strike, remove and destroy all affected seedlings and water the rest with the fungicide.



seedlings affected by damping-off

Derris

Derris (rotenone) is a very useful insecticide, obtained from the roots of a tropical plant, that is nontoxic to humans and warm-blooded animals. Never use it near fishponds however as it is poisonous to fish. It is effective against most sucking and biting insects, and is used to control aphids, caterpillars and other insect pests, in the form either of a spray or of a dust. As always, you should follow the manufacturer's instructions carefully when using derris sprays or dusts.

Dibber

This is a tool used for making holes in the soil in which to sow seeds or plant seedlings or cuttings. The size of the dibber to be used depends on the size of the seeds or plants. Large dibbers are manufactured with wooden handles and steel tips, which can be pushed into the soil easily, while others are made entirely of steel. You can easily make your own dibber from an old spade or fork handle. For very small seeds or plants, a pencil or piece of doweling can be used. A dibber should have a rounded and not a pointed tip. If a pointed dibber is used, an air space will be left beneath the plant and the roots will be unable to take in food and water. The planting of a large number of young plants can be done much more quickly with a dibber than with a trowel.

Double digging

There are several different methods of digging, but all have the same objectives: to break up the soil so that the air can penetrate and the natural processes of decay release the plant nutrients, to improve the drainage, to help destroy weeds, and to provide a method of mixing manures or fertilizers with the soil. Double digging is the method in which the soil is cultivated to a depth of about 20 in (50 cm), the first spit being dug out with the spade, the second spit being broken up with a fork and manure incorporated into it if necessary. The top of soil is then replaced.

Disbudding

This term usually refers to the removal of buds of such plants as roses, carnations, dahlias and chrysanthemums so that they produce fewer flowers but of greater size. It is also used to describe the removal of buds on the young shoots of fruit trees, to help shape the trees or increase the crop of fruit.

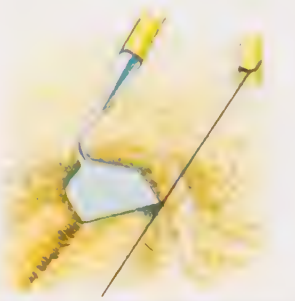
Division

This is a method of vegetative (i.e. nonsexual) propagation, in which a plant is separated into two or more parts, each part complete with roots and growth buds. Division should be done either in spring or in autumn, and the divided parts should generally be planted immediately. Plants in the kitchen garden propagated by division include potatoes and Jerusalem artichokes, the tubers of which are cut with a knife into two or more pieces, each bearing buds or 'eyes,' and raspberries, whose suckers, which must bear roots, may be dug up and cut off from the parent plant and then replanted.

division of potato tuber

Drill

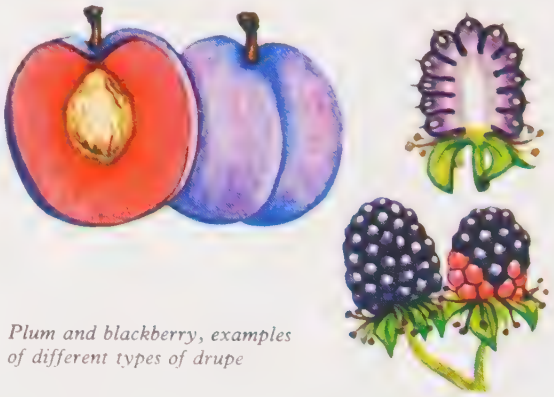
A drill is a shallow furrow made, or 'drawn,' in the soil to receive seeds sown in straight lines. Drills of different widths and depths are drawn by different methods. Shallow drills can be drawn with a plant label or pointed stick, or by pressing a rake or hoe handle into the soil, while deeper drills are usually drawn by pulling a draw hoe through the soil with the head held at an angle. The depth of the drill can be varied according to the pressure placed on the hoe. Make sure that drills are the correct depth for the seed being sown, and that they are the same depth throughout. Using a garden line helps keep them straight.



drawing a drill with a draw hoe

Drupe

A drupe is a fruit in which the hard seed, or stone, is protected by a thick layer of flesh. The flesh is then covered by an outer skin. Cherries, plums, peaches and others with stones are drupes. Compound drupes are fruits which are made up of clusters of tiny flesh-covered seeds. These are usually referred to as berries (raspberries, blackberries, etc.), though they are not berries at all.



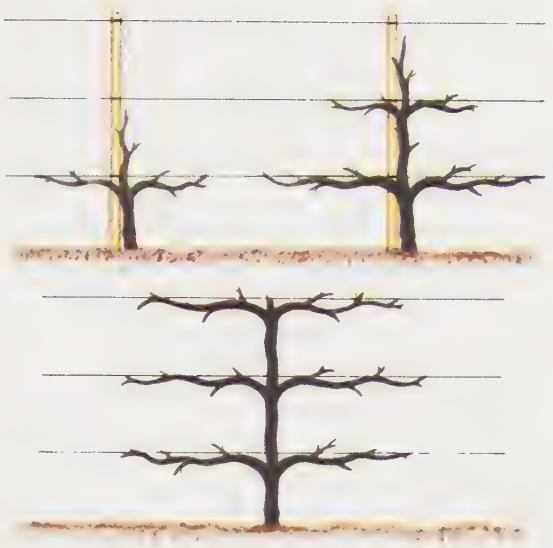
Plum and blackberry, examples of different types of drupe

Earthing-up

Earthing-up, or hilling-up, is a common and important practice in the vegetable garden. It is a simple process which involves drawing up loose soil around growing plants. There are several reasons for earthing-up plants. Usually it is done to blanch the stalks of plants like cardoons and celery. Potatoes and other root crops are almost always earthed-up so that the tubers do not come too close to the surface and turn green. Sometimes gardeners earth-up tall-growing plants to improve the anchorage and protect them from windy weather.

Espalier

In the fruit garden, espalier refers to a system for training fruit trees, either along horizontal wires supported by posts or supported against a wall. Apple and pear trees are often grown like this. The trained trees are also known as espaliers. To form an espalier, the branches of the young tree must be made to grow out from the trunk and along the wires. Each year new growth must then be trained on a higher wire. Espaliers are usually grown to about four or five tiers, but it is possible to grow them over twenty wires or more.



Eye

The term eye has several meanings to the gardener. It can refer to the center of a flower when it is a different color from the petals. The most common meaning is to describe the growth buds on a tuber, particularly on potatoes. An eye to the fruit grower is the growth bud which is removed with a piece of the stem, usually from vines, for the purpose of propagation.

grapevines can be propagated from cuttings with 'eyes'

Fan

In the garden, fan refers to a method for training fruit trees, usually plums, peaches, nectarines, apricots and cherries. Blackberries, loganberries and similar plants can also be fan-trained. Apple and pear trees can be fan-trained, but they are really more suitable for cordons or espaliers. Fan-trained trees are always trained against a wall, with branches radiating in a fanlike pattern from the central stem. This minimizes the amount of space the tree occupies in the garden and helps to increase yield.

fan-trained tree shape

Fallow

Land which has been left uncultivated for a time is said to be fallow. Leaving land fallow is a more common practice on farms than in small home gardens, but it still may be necessary to fallow a part of your garden, particularly if there has been an infection of eelworm, club root, or another serious pest or disease. Leaving the ground fallow is thought to increase the fertility of the soil, as various minerals and organisms will have a chance to build up in the garden.

Fertilization

The union of two cells of the opposite sex to produce a new organism is called fertilization. In the garden, fertilization is always the result of pollination, when the pollen grains produced by the anthers (male part of the plant) unite with the ovules (female part of the plant). In most plants, either insects or the wind will transfer pollen, and fertilization will take place naturally. However, in some plants the gardener may need to help with the process by transferring pollen artificially. This is important if you grow fruit trees, or such cucurbits as melons and squashes indoors.

F_1 Hybrid

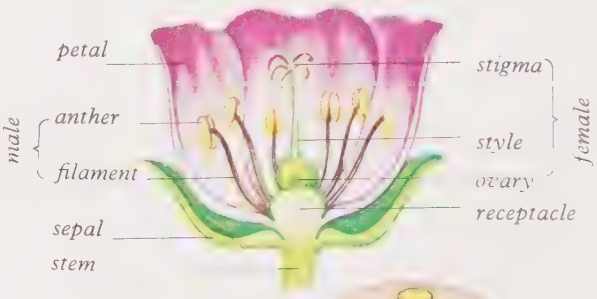
Many of the seeds offered for sale are F_1 hybrids. This means that they are the first generation of plants which result from crossing two varieties or two species. Such crosses are usually much stronger than the parents, producing larger plants or healthier crops. The F_2 (second) generation is much less vigorous, so F_1 crosses have to be made each year, making such seed expensive but worth the price.

Flower

Almost all plants in the fruit and vegetable garden produce flowers. In all cases, flowers are the organs for reproduction in these plants. Flowers can contain the reproductive parts of both sexes, or of only one sex.

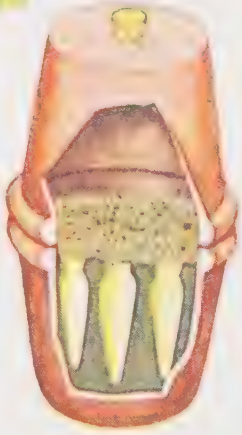
The main parts of the flower are the calyx (sepals), the petals, the stamens (male part) and the pistil (female part). The brightly colored petals help to attract pollinating insects to the plant, so that pollen can be taken from the male to the female part and fertilization can take place.

simple cross section showing basic parts of a flower



Forcing

This is a method for hastening the growth of plants, usually by applying heat. Plants in the kitchen garden which are usually forced include rhubarb, chicory and chives. Rhubarb is forced to have it ready for cutting earlier than would be possible if it were left to grow at its own pace. Chicory is more often forced to blanch the stems and make them more tender. Rhubarb is forced in the darkness of greenhouse shelving, or in a cellar or shed; chicory is usually forced in boxes or by covering the stalks with flowerpots.



forcing chicory

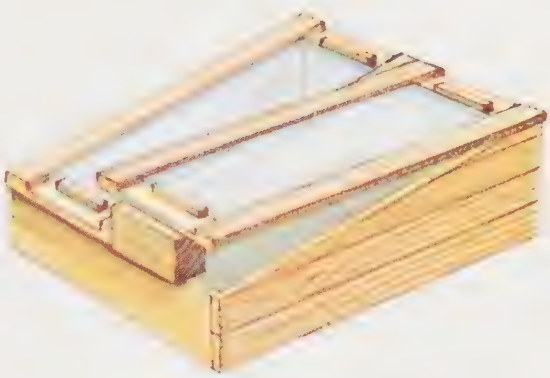
Formalin

This is a solution used as a disinfectant by gardeners. It is prepared by mixing formaldehyde with water, to produce a 2% solution, the home-grower can often purchase the solution already prepared by asking a druggist to fix it. Formalin is most useful for disinfecting soil in the greenhouse or garden frame, or for sterilizing seed boxes, pots and tools. Prior to sowing, a very dilute solution can also be used to treat seeds against certain seed-borne diseases; treating celery seeds to prevent leaf spot is one example.

using formalin to sterilize pots

Frame

A garden frame is a structure used for growing plants under glass, with some degree of protection from the weather. A standard frame has either wooden, metal or brick sides and is covered by a light top, preferably of glass but sometimes of plastic. Frames can be unheated (cold frames) or heated. A cold frame is useful for hardening off seedlings, protecting tender crops and forcing out-of-season fruit and vegetables. A heated frame can be used as a miniature greenhouse, growing virtually any crop you can raise in a greenhouse, within the limitations of the height of the frame. Electric cables are generally regarded as the most efficient heating method.



common type of frame

Friable

In gardening, friable describes a condition of the soil. Friable soil is the best for most gardening operations, being crumbly, neither too dry nor too moist, and very easy to work.

Frost Protection

Frost conditions, which take place when the temperature falls below 32° F (0° C) can cause severe damage to growing plants. Both air and ground frosts can occur, and ground frost can be the most serious. Frost causes the water in the plants' tissue to freeze and can kill tender plants. 'Dessication' is another kind of injury which occurs in frosty weather; the water in the soil freezes and cannot be absorbed by the roots of growing plants, so they dry out.

frost protection of cauliflower

There are various methods of frost protection available to the gardener. Portable frames offer excellent protection for most plants, or you can cover crops with straw, leaves, plastic sheeting or layers of newspapers. Protect fruit trees by draping with burlap. Certain cabbage relatives can be protected by carefully folding the tough outer leaves over the more tender inner curds. Remember that frost is also of some benefit to the gardener. Some vegetables, such as parsnips, improve in flavor after being touched by frost, and frost action actually helps to break down heavy soils.

Fruit

A fruit is a case containing one or more seeds. It is usually formed from the ovary and ovule, which develop into the fruit wall and the seed respectively. This is a botanical definition; the word 'fruit' is used in a general way to refer to the edible part of certain plants. Apart from the obvious 'fruits' that are grown, many vegetables are in fact fruits; examples are tomatoes, eggplants, cucumbers and the pods of peas and beans.

Fumigation

This is a method of destroying pests or disease-producing organisms by using poisonous fumes. Although there are special techniques for fumigating areas out of doors, fumigation is most useful in closed places like greenhouses or frames.

There are a variety of chemicals available for fumigation, depending on the organisms to be destroyed. These are sold in smoke canisters of differing sizes; choose the right size for your greenhouse. To fumigate a greenhouse, first be sure that there are no leaks and that all the doors and windows are tightly shut.

smoke canister for fumigation

Light the canister, place it in the center of the greenhouse, and leave quickly. Follow instructions on the canister, and leave the greenhouse closed for the specified period. The smoke may settle as a fine film on the foliage, forming a fine protective covering. After fumigation, air the greenhouse thoroughly.

Fungus

Fungi form a large and varied group in the vegetable kingdom. Although they differ widely in form and appearance, all fungi lack chlorophyll and are thereby unable to manufacture their own food. Hence they must live on other plants or on decayed matter.

To the gardener, fungi, with the notable exception of mushrooms, are regarded as disease-producing organisms. Many common crop ailments, including mildews, smuts, spots and scabs, are caused by fungi, and various products, known as fungicides, are used to destroy them when applied in the form of dusts, sprays or as systemic controls.

Galls

Galls are abnormal growths on plants. They can appear on leaves, stems, roots or flowers, and they are caused usually by insects laying eggs, but sometimes by mites or fungi. Galls can be of any shape or size, but they are most commonly rounded, blisterlike lumps. Examples of galls include the swellings of 'Big Bud' on black currants, red blistering on pear leaves, caused by mites; distortion of pear fruitlets caused by midges; and the serious fungus-produced crown gall disease of fruit trees. Plants suffering from galls should be treated immediately, as these infestations can be severe and limit cropping in many cases.

Gall mite damage on brassica root

Genus

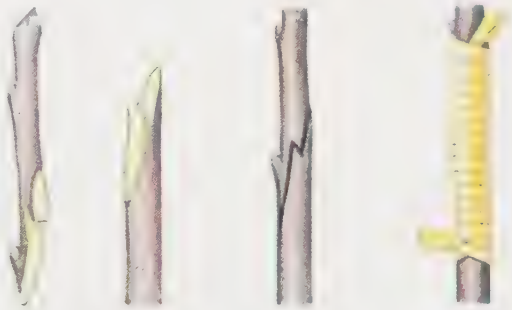
In the system of classification for plants, genus is a basic unit which encompasses many species. All the members of a particular genus have certain characteristics in common. They are also susceptible to the same pests and diseases. Cabbages, broccoli, Brussels sprouts, turnips and rutabagas, for example, are all members of the genus Brassica. The plural is 'genera' and one or many genera comprise a family.

Germination

Germination takes place when a young plant 'escapes' from its seed coat by thrusting a root down into the soil and a shoot up into the air. As germination will only take place under favorable conditions, the gardener must ensure that the seed is provided with the correct amounts of air, warmth, moisture and light at sowing time and during the early stages of growth. Times for germination vary widely, from a few days for radishes to several weeks for parsley. Germination is complete when the first seed leaves unfold and the seedling becomes self-supporting; that is, it can manufacture its own food and no longer relies on the stored nourishment of the seed.

Grafting

Grafting is a method of propagation often used for fruit trees. The aim is to unite the stem of a selected variety to a suitable rootstock for the purpose of producing another fruiting plant. The stem and rootstock must be very closely related, or the graft will not be successful. The principle behind grafting is that a continuous close contact between the exposed, living cells of rootstock and stem will produce a union and growth will continue as a single plant.



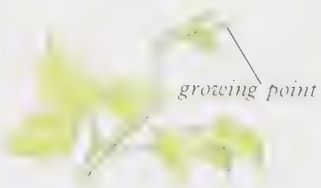
stages in grafting

Green Manure

This is a term used to describe a green, leafy crop, grown specifically to be dug back into the soil. Green manuring is an effective and inexpensive way of improving the organic content of the soil. By stimulating the action of nitrogen-fixing bacteria, it also helps to conserve the soil's stores of nitrogen, and, if a leguminous crop is used, the nitrogen content will actually be increased. Green manure should be dug in when the plants are fully grown, but before they have produced seed. After the crop has been incorporated into the soil, the initial effect is that the action of the bacteria causes a nitrogen loss. This can however, easily be remedied by giving a dressing of a nitrogenous fertilizer as sulfate of ammonia. The loss of nitrogen is fortunately only a temporary situation, and the soil will eventually recover and be left much richer than before. The most common crops used for green manuring include clover, mustard, rape, rye grass, buckwheat, winter rye and vetch. Weeds can also be used, if they have not seeded.

Growing point

This is a term used to describe the point at the extreme tip of shoots or roots. At each growing point there is a mass of cells which divide to produce new growth. Removal of the growing points on the shoots of plants will usually encourage the development of side-shoots further down the plant.



pole bean plant

Hardening off This is the process of helping plants become accustomed to growing conditions which are more rigorous than those which they have been used to. Greenhouse-grown plants used to very warm conditions must be hardened off before planting into the open ground. Considerable skill is necessary to harden off well for, if the process is hurried, growth will be checked or leaves may become streaked or die.

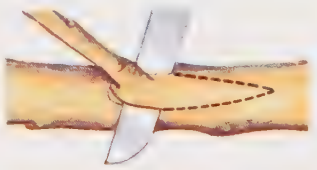
The first stage in hardening off is to lower the greenhouse temperature, or to move the plants into a frame where the temperature can be carefully controlled. The frame's glass can be opened gradually, then removed first during the day and then at night until the plants are accustomed to outdoor temperatures.

Hardy **(and Half-Hardy)** Hardy is a term that describes plants which can withstand a normal amount of frost, and can spend the entire year out of doors. The term, however, is not a precisely defined one. Obviously, it varies from one climatic region to another and a number of factors may affect and change the hardiness of a plant. If an exceptionally high degree of frost occurs, plants which are hardy in more normal conditions may be damaged. Some plants may withstand frost during the dormant winter period and produce new growth in an unusually early warm spell, only to be damaged by the sudden return of frost at a later stage. Similarly, plants grown for a time under the protection of glass may lose some of their hardiness, but this will soon return if the plants are gradually exposed to lower temperatures. Soil conditions, and the amount of moisture in the soil and air, can also affect hardiness.

Half-hardy plants are those which can be grown outdoors during summer, but need protection at colder times of the year. Half-hardy annuals cannot be sown out of doors until late spring, but may be started off earlier under glass and planted out in early summer.

Haulm This is the name given to the unproductive stems and leaves of certain vegetable plants. The leafy tops of potatoes and the stems of peas and beans after the pods have been picked are examples of haulms.

Heel In gardening, heel is a term describing a strip of bark and wood retained on a shoot removed from a main branch. The heel is a part of the main branch, and is usually trimmed back close to the shoot before the cutting is used in grafting. This type of cutting is known as heel, or bud, cutting.



heel cutting

Heeling in This is a method of temporary planting to help plants remain in good condition until they can be put into permanent positions. It is particularly useful for young fruit trees and bushes, which often arrive from the nursery when conditions in the garden are too cold or wet for planting out. To keep the plants in prime condition, dig a trench or hole and place them in it with the tops leaning against the side. Then cover the roots completely with soil and firm it down. Heeling can also be used for bulb crops such as leeks. If growth is complete and the site they occupy is needed for another crop, lift them and heel them in somewhere else in the garden. This will prolong freshness, and the plants can be left heeled in for several weeks.

Herb

The term herb has two meanings to the gardener. Botanically it refers to any plant with a succulent, rather than woody, stem which dies completely or dies back to the roots every year. However, to most gardeners herb means one of the plants grown primarily as a seasoning for food. Herbs are also grown for their seeds, scented leaves or flowers, and occasionally, for their medicinal properties. A special garden for herbs can easily be included in the vegetable plot. Herbs are also possible indoor plants, as they grow well, take up little space, and are useful plants.

some common herbs: (left to right) rosemary, coriander, lovage

Herbaceous

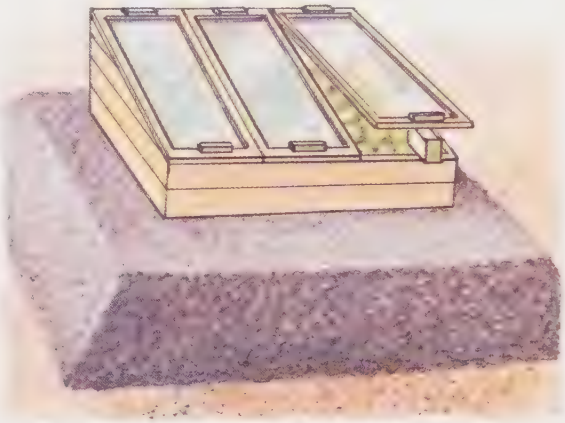
A herbaceous plant is one which has a soft growth, rather than a woody stem. Annuals die completely, while perennials merely die back to the ground each autumn. Most vegetables are classified as herbaceous.

Herbicide

A herbicide is a chemical used to kill or control unwanted plants. The chemicals can be either selective (killing weeds among other plants) or nonselective (killing all vegetation). The type used depends on the variety and extent of the weeds to be destroyed. Herbicides kill vegetation by burning it or because the poisons are absorbed through the leaves and circulated through the plant. Application can be by watering can, foliar spray, hand spray or granules.

Hot bed

A hot bed is a pile of decomposing organic matter which produces heat while it rots. Once widely used in gardens as a source of heat, the hot bed has now been largely replaced with electric warming cables. However, a frame can be placed over manure for an inexpensive way of producing out-of-season crops. Horse manure and well-rotted straw or leaves are the best constituents; build them into a heap which will rot down and produce heat.



frame over a hot bed

Humus

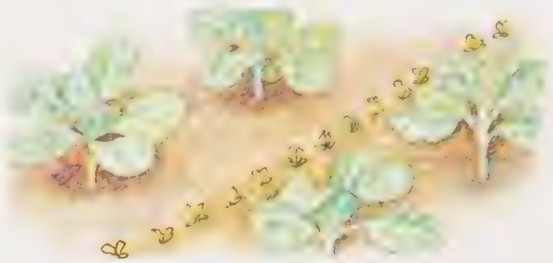
This is a term used to describe the organic matter in the soil. Humus may consist of decayed vegetable or animal waste, which still shows traces of the leaves, stems, bones, etc., or it can be completely broken down into a blackish, powdery substance. Adequate quantities of humus in the soil are essential for successful crops, as humus is important for supplying nutrients and for moisture retention. Since all soils lose organic matter, humus must be added periodically in the form of peat, leafmold, manure, compost, seaweed, well-rotted straw, or spent mushroom soil.

Hybrid **and hybridization** A hybrid is any plant which has been produced by crossing different species or by crossing different varieties of the same species. This process of crossbreeding is known as hybridization. Hybrids can occur naturally. Most often, however, hybridization is the result of careful and selective breeding to improve the species or variety.

Insecticide An insecticide is any chemical used to control insects. The substances are marketed in various forms, such as emulsions, powders, dusts, aerosols, granules and smoke pellets, for use against various insect pests and on different crops. The range of insecticides available to the home-grower is limited by regulations which restrict the use of some of the more poisonous substances available to commercial growers. When choosing an insecticide, consider the pest to be controlled, its life cycle, feeding habits, etc., and the crop which is being attacked. In general, the home-grower should only use insecticides when it is absolutely necessary, and then use the safer ones such as rotenone, pyrethrum, Sevin and malathion, according to directions.

Intercrop

Intercropping is the practice of growing a quick-to-mature crop between the rows of a slower-growing crop, in order to make the best use of space in the garden. For example, rows of lettuce can be planted between rows of Brussels sprouts.



Lateral In gardening, a lateral is a side-growth, which can be either on a branch or a shoot. When pruning, it is important to distinguish between the laterals and the leading or terminal shoot, the leader, which is at the end of the branch. In most methods of pruning the laterals are cut back hard while the terminal shoots are lightly pruned, unless the space available has been filled.

terminal shoot and laterals

Layering This is a method of propagation by which a long, healthy new season's stem from a parent plant is pegged down onto the soil and encouraged to form roots and thus a new plant. Sometimes the stem needs to be notched, but others begin to form roots even before coming into contact with the soil. Strawberries, loganberries, blackberries and figs can all be propagated this way.

layering strawberry runners

Leaching

When soluble plant foods are washed out of the soil, the process is described as leaching. Fertilizers can be lost through leaching if they are applied at too great a concentration, or if they are applied at the wrong time. A certain amount of leaching is inevitable, particularly in districts where the rainfall is heavy, but some can be avoided by adding partially decomposed manure to the ground before planting, so that it will be fully decomposed by planting time and will be able to release plant foods. The manure also acts as a sponge and retains moisture and plant foods. Green manuring is also useful to prevent leaching.

Leader

The leading or terminal shoot at the end of a branch is known as the leader. When pruning, it is important to distinguish between leaders and laterals, or side-shoots, as they require different treatment. Leaders if left unpruned will continue to grow and extend the branches in that direction.

Leaf

The leaf is one of the main parts of a plant where food is manufactured. Chemicals absorbed by the roots travel up the stem to the leaf, which is usually a lateral outgrowth, where chemical changes brought about by photosynthesis produce food for the plant. Because the leaf serves such an important function, the gardener should take care not to damage or allow pests and diseases to damage leaves, and not to remove too many leaves from a growing plant.

Leafmold

This is a gardener's term for decayed leaves, referring to the blackish material that results from allowing them to decompose over a period of time. This process takes about a year, and when it is complete there should be only fragments of leaves, with no whole ones remaining. Leafmold is a good source of plant foods, and it can be used as a top-dressing, dug into the soil to improve the humus content, or used in potting mixtures.

Leguminosae

This is a family of plants which is characterized by the production of seed borne in a pod, which is sometimes woody. Members of the *leguminosae* family in the vegetable garden include peas, beans and other vegetables, which are commonly referred to as legumes. The seed-pod is also called a legume.

pea plant in flower

Lime In gardening, lime refers to a calcium-containing material which is capable of reducing the acidity in the soil. Very few plants will thrive in a too-acid soil because the amount of food available is reduced, while too many harmful substances are taken in. Liming the soil helps to correct these imbalances, as well as improving the tilth and helping to control certain pests and diseases. Legumes and brassicas, in particular, prefer soils which have been limed.

Loam Loam is a type of soil which is composed of sand, silt and clay in roughly equal proportions. Soils classified as loams can vary between sandy loams to clay loams, depending upon the exact proportions of the constituents. Almost all crops in the kitchen garden will thrive on loams, as they are fertile, moisture retentive and rich in nutrients.

Maiden In the fruit garden, a maiden or whip is a term which describes a grafted or budded plant in its first season of growth, before any pruning has been carried out. The term is usually applied to young fruit trees.

maiden fruit tree

Malathion This is one of the most valuable of the modern chemical insecticides available to the home grower. It can be obtained as sprays, dusts or aerosols, and it is particularly effective against sucking insects such as aphids, red spider mites and thrips. Malathion is one of the safest phosphorus-containing insecticides available; produce which have been treated with it can usually be harvested and eaten within a few days.

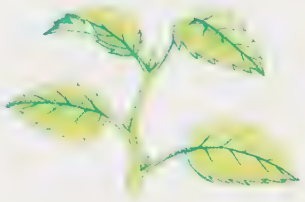
Manure Manure is a bulky, humus-forming substance of animal origin which is applied to soil mainly to improve its structure and also to supply nutrients. The fertility of most soils treated with this organic material steadily increases to an optimum level at which plants will crop to their maximum extent. Garden composts, seaweed and certain industrial wastes such as spent hops and coffee grounds are all substitutes for manures. The various animal manures—horse, cow, pig, chicken, etc.—all have different nutrient contents.

Mulch A mulch is a cover spread over the surface of the soil, either to inhibit weed growth, to help retain moisture, or to help improve the level of nutrients in the soil. Materials for mulching include garden compost, farmyard manure, peat, straw and sheets of black polyethylene, depending on what is available and the crop to be mulched. A well-mulched garden needs less time and work to keep it weed-free and watered, and it will be easier to maintain the proper soil temperature.

a mulch of manure

Nitrogen Nitrogen is one of the major elements needed for successful plant growth. Although nitrogen itself is a gas, plants make use of it in the form of compounds derived from the soil. The requirement for nitrogen differs with varying crops, and the needs of individual plants differ during their growing cycles. Plants grown in soil deficient in nitrogen will have pale green or yellow leaves and may be stunted in growth, so it is important to see that soluble nitrogen compounds are added to the soil. Generally, an application of a good complete fertilizer will supply sufficient nitrogen, along with other necessary elements.

Node To the gardener, node refers to the joint on a plant stem. In most cases, leaves or flower buds arise at the nodes. When taking cuttings for propagation it is important to recognize the nodes, as the cambium layer just below the node is usually the best part of the plant for producing new roots. The spaces between the nodes are known as the *internodes*. In certain plants, cuttings are most successful when taken from these areas.

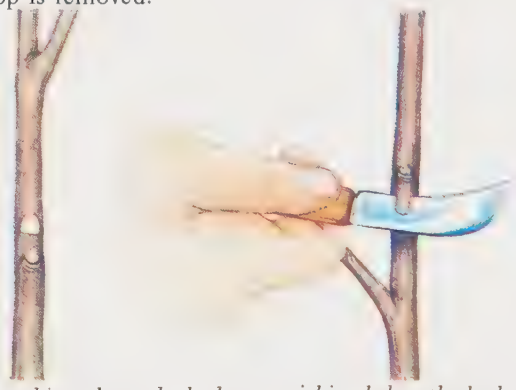


nodes on plant stem

Nodule A nodule is a small swelling on the roots of certain plants, particularly legumes, which helps to convert the atmospheric nitrogen in the soil into a form of nitrogen useful as plant food. The nodules contain certain bacteria which do this work, a process called nitrogen fixation. In this way, legumes can thrive in soil which has little or no nitrogen, and soil in the garden is richer after a legume crop is removed.

roots of a legume have many nodules

Notching (and nicking) Notching consists of cutting with a knife a tiny half-moon of bark immediately above a growth bud on fruit trees to stimulate growth. If the cut is made immediately below the bud, the process is called nicking, and it is used to check growth. Notching and nicking are frequently used to build up the main framework of fruit trees in the early years.



notching above the bud *nicking below the bud*

Organic matter In gardening, organic matter refers to materials of animal or vegetable origin used to improve and maintain the quality of the soil. Many of the materials, such as manures, are waste products, and they are allowed to rot before being added to the soil.

Parthenocarpic This is a term for a plant which produces fruit, usually seedless, without fertilization. Some plants, such as certain varieties of grapes, produce fruit naturally without seed, but it is necessary to induce this in certain other plants. Tomatoes and strawberries, for example, can be made to produce seedless fruits by means of hormone sprays. Greenhouse cucumbers should not be allowed to become fertilized, as the resulting fruits are bitter. Unfertilized cucumbers may still have seeds.

Peat

Peat is partially decayed organic matter formed when the remains of plants collect in waterlogged areas. This process takes many hundreds of years. Decay is incomplete because it takes place under conditions which lack oxygen, hence preventing any great bacterial activity. There are two main kinds of peat. Sphagnum peat (peat moss) holds up to 15 times its own weight of water and is very acid. Sedge peat, which is less spongy, holds up to eight times its weight in water and has a pH varying from 3.5 to 7.0. The main value of peat is that it can be dug into the soil to improve the soil structure or used as a mulch.

Perennial

A perennial plant is one which does not die after flowering and persists for several years, in contrast with an annual which flowers once and dies after setting seed, and a biennial which takes two seasons to complete its life cycle. Perennial can be applied to shrubs and trees, but it is more often used in conjunction with the term 'hardy herbaceous'; most such plants are grown as ornamentals. Most plants in the vegetable garden are not allowed to be perennials, although in the wild they may be. Fruit trees and bushes are woody perennials; strawberries are short-lived perennial plants.

Pest

Any creature which causes damage to garden plants can be regarded as a pest. Most garden pests are insects or insectlike creatures, and virtually every plant is subject to infestation and damage by some kind of pest. The damage is usually caused by the pest feeding on the host plant. Pests can weaken plants and spread virus and other diseases, and they can attack the plant at almost any part—roots, leaves, etc. Other pests include rodents, birds and, occasionally, larger animals such as dogs, cats and deer, which not only do damage by feeding, but also by mechanical injury, such as digging up plants or rubbing the bark off trees.

pH

This is a scale used to measure the acidity of the soil, and it has a range of figures between 0 and 14. Each figure shows a decrease or increase of ten times the previous figure. The scale is based on the balance between the hydrogen particles and the hydroxyl particles present in the soil. A pH of 7 indicates a neutral reaction; a figure below that indicates acidity, while a figure higher than 7 indicates alkalinity of the soil. Simple kits are available to determine the pH value of the soil, and it is a good idea to test samples from different parts of the garden, as the acidity can vary slightly. A too acid soil can be corrected by liming, while one that is alkaline can be helped with applications of flowers of sulfur, ammonium sulfate, etc.

Phosphorus

One of the essential elements for growing plants, phosphorus is a constituent of every living cell. Plants take in phosphorus in the form of phosphates, which are salts of phosphoric acid, as the element is never found in soils as pure phosphorus. Phosphates are needed mainly for early root formation, and are particularly useful to seedlings and young plants, and for speeding up flowering, fruiting and ripening.

Pinching out

When the growing tip of a shoot is removed with the finger and thumb, the operation is called pinching out, or simply pinching. Pinching out is done to stop any further direct extension of growth, and to encourage the production of sideshoots. It can also help to divert the plant's resources from producing new growth to forming and ripening fruit. A similar operation in the fruit garden is pinching back, stopping the extension growth of the young shoots early in the growing season by severing them cleanly between the nails of forefinger and thumb.

pinching out top growth

Pollination

This is part of the life cycle of a plant which precedes fertilization and involves the transfer of male pollen cells to the female stigma. Pollination is necessary for fertilization to occur. Most plants rely on insects, mainly bees, to transfer pollen, although the wind or creatures such as bats and birds can also transfer the pollen. With some plants it may be necessary to use a paintbrush to transfer pollen grains; occasionally pollination must be prevented by removing the male flowers.

using a paintbrush to pollinate apricot flowers

Potassium

Potassium is one of the major essential elements necessary for the manufacture of starches and sugars. It is associated with the maturity of the plant, and, hence, with the production of fruit, and it also improves the color and flavor of certain fruit and vegetables. Potassium is absorbed from the soil in the form of various potassium salts; clay and silt soils tend to be fairly rich in these. Soils which contain little clay or humus need to have the potassium content improved with applications of potash-rich fertilizers. Plants suffering from potassium deficiency are more vulnerable to disease and frost damage. However, too much potassium can produce a magnesium deficiency in the plant, which should also be avoided.

Potting

(and Repotting) One of the stages in the cultivation of many plants is growing in pots, and the placing of plants in pots is known as potting. For most vegetables, this is temporary and is done before planting out in the ground, although many plants will complete their life cycles in pots. Successful potting depends on the use of a suitable mixture of soils and/or other ingredients, and any of a number of potting mixtures can be used, depending on what is being grown. Pots must be thoroughly clean before potting, and the drainage hole should be covered with coarse gravel, etc. The pot is then filled with potting mixture and the plant or seed carefully put into it and firmed. Repotting simply means moving a plant into a larger-sized pot. This is important to keep the plant from becoming pot bound, thus restricting the root growth and eventually killing it.

potting on young capsicums

Propagation

Propagation is the increasing or multiplying of plants. In nature, plants are propagated both vegetatively and by seed, but the latter is not always possible with cultivated plants. Therefore, it may be necessary for the gardener to propagate plants vegetatively by one of the many methods available. These methods include division, layering, budding, grafting and taking suckers and cuttings.

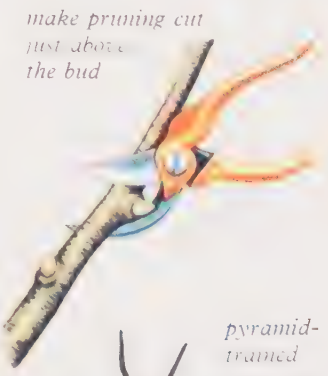
Propagator

In the garden, a propagator is a closed container in which seeds and cuttings are placed, and is used to encourage germination and rooting when conditions outdoors are not favorable. A propagator is usually a shallow container, either wood or plastic, with a glass or clear plastic cover. Artificial heat can be supplied with some makes of propagator so that conditions for germination and rooting are even more favorable.

small propagator

Pruning

Pruning, cutting back woody growth, is an important part of the cultivation of tree, bush and cane fruits. The main purpose of pruning is to encourage cropping in an orderly fashion. Some fruit trees may require a great deal of pruning, while others will need very little or none at all. The basic principles of pruning are the same for all fruits, although the application may differ depending on variety and other factors. Basically, pruning must remove dead or diseased shoots, take out broken, weak or overcrowded branches, encourage a moderate amount of young growth, and reduce an excessive number of fruit buds. Pruning is necessary to help establish newly planted trees and bushes, and it is essential to maintain the shape and productivity of older trees.



make pruning cut just above the bud

pyramid-trained pear tree

Pyramid

In the fruit garden a pyramid is a form in which fruit trees can be trained. A pyramid is obtained by growing a vertical central stem from which horizontal branches radiate. The shape is conical, rather like a Christmas tree. Certain varieties of pears grown on dwarfing rootstocks are particulary suitable for pyramid training.

Pyrethrum

Pyrethrum is one of the most widely used insecticides in the home garden. It is obtained from the flower heads of *Chrysanthemum cinerarii folium,* a daisylike flower grown mainly in East Africa. Pyrethrum is a safe insecticide to use on food crops, as it is practically harmless to humans and pets, and can be used where crops are soon to be harvested. It is available in various forms, such as dusts, pressure cans and sprays, and is useful against a wide range of insect pests. Pyrethrum's main effect is 'knockdown' but, mixed with slower-acting insecticides, as it often is, produces very effective results.

Ridging

Ridging is a method of digging on heavy soils. Instead of leaving the soil level, as happens in ordinary digging, the soil is thrown up in ridges, with furrows between them. The plot resembles a plowed field, and there is consequently a greater surface of soil exposed to weather.

ridge and furrow system

Ring culture

This is a method of cultivation used primarily for tomatoes indoors. In this method of cultivation, the top 6 in (15 cm) of soil in the greenhouse ground bed is replaced with an aggregate of washed clinkers, weathered sand or similar draining material. Young established plants are placed in bottomless, stout paper rings filled with good potting soil and the rings are placed on the aggregate, where the root system becomes established.

Ringing

Ringing, or bark ringing, is a method of slowing down the growth of fruit trees which have produced vigorous woody growth at the expense of fruit. Ringing involves removing two narrow strips of bark and cambium, ½ in (1.3 cm) wide, from the tree trunk, deep enough to reach the hard wood beneath. This is carried out by removing two narrow semicircles of bark on opposite sides of the tree and a few inches apart. Another way is to remove a spiral strip. In all cases, protective paint must be applied to the wound, to prevent fungal or bacterial infection invading the tree.

ringing fruit trees slows down woody growth

Root

The root system is a vital part of all growing plants. Roots have two main functions: they anchor the plant into the soil, and they absorb nutrients and water from the soil. In addition, they transport water and nutrients for the growth of the above-ground parts of the plant and, in some instances, act as a storehouse for plant foods. Certain vegetables, such as carrots, beets, radishes, rutabagas and turnips, are the root of the plant, and are known as 'root crops.'

brassica root

Rootstock

To the fruit grower, rootstock refers to the root system upon which a particular cultivated variety has been budded or grafted. This grafted-on part is known as the scion, and if the scion were allowed to form its own roots, growth would not be as wanted. Grafting onto an established rootstock ensures that the tree will be of suitable size and vigor for successful cropping. Special rootstocks have been bred for apples and pears, as well as for certain ornamentals. Grafting or budding onto a suitable rootstock is also a method of propagation for varieties which would otherwise not breed true from seed.

Runner In gardening, runner describes that part of a plant which grows along the surface of the soil. The runners produce one or more plantlets, which may form roots at the buds or nodes. These plantlets are a quick way of increasing stock, since these portions of the stem may be detached and planted elsewhere when the roots have formed.

runners formed on strawberry plant

Scion This term refers to the young growth cut from a plant for the purpose of making grafts. The scion, which must contain a bud growth, is grafted or budded onto the trunk, branch or root of a related plant; this provides the stock. The branches, leaves, flowers and fruit are all provided by the scion, and the roots are provided by the stock. Normally, the stock does not influence the character of the scion beyond determining its size and vigor.

diagram of grafted tree

Seed A seed is an embryo plant, consisting of a root and shoot as well as a supply of food. Seeds are produced after the fertilization of the flower, and are the principle means by which plants are reproduced. In order for a seed to germinate, moisture and warmth are usually necessary, but other factors are also involved. The moisture will be taken in through a hole in the protective seed coat (the testa), and the food reserve provides the energy for growth of the embryo before the root develops. Once the root appears, it can absorb food from the soil, and anchor the tiny plant, while the shoot begins to grow. Germination does not necessarily have to take place with a seed buried in soil; different plants vary in their requirements for germination as far as amounts of light, warmth, soil quality, water, etc. are concerned.

Seedbed A seedbed is a specially prepared site where seeds are sown. It may be in a frame or in the open ground. There are two types of seedbed. In the first type, seeds are sown to provide seedlings for transplanting elsewhere at a later date. In the second type, plants are permitted to grow to maturity where the seeds are sown, and the excess seedlings are removed while still very young. In both types of seedbed, a good tilth and well dug soil are necessary. It is also very important that the surface of the soil has been leveled, so the seeds are not sown at widely varying depths.

Seedling A seedling is a very young plant which has been raised from a seed. These young plants produce seed leaves, which are the first to appear after germination, and can be produced singly or in pairs. Seed leaves are very simple and quite unlike the true leaves, which are the next leaves to appear.

Seedling can also be used to describe a mature plant which has been raised from seed, when it is usually reproduced by vegetative propagation. Such a plant may not be identical to the parent plants, and can be quite different. If it performs well, it can be given a name and denoted as a new cultivar (cultivated variety), which will itself be vegetatively propagated.

a typical seedling

Set Set has three meanings to the gardener. In the fruit garden, set refers to the condition of the blossom after pollination, when the fruit begins to form. The old expression 'a good set of fruit' means that pollination has been successful. To the vegetable grower, the term refers to the tubers used for potato planting, and to small bulbs of the onion family ready for planting. Onion sets have always had their growth interrupted, by heat treatment, so they do not sprout prematurely. Finally, to set a plant in the garden means to plant it.

Soil Soil can be broadly defined as the natural medium for growth of all land plants. The rocks in the earth's crust are broken down by weathering, and this provides the mineral content of the soil. Organic matter must also be included, either through the natural decay of living matter, or by the addition of humus, manure, etc. The composition of soils in different areas varies widely, from sandy types through rich loams to heavy clays.

Soil can be divided into two layers—topsoil and subsoil. The topsoil, quite literally the soil at the top of the ground, is the most fertile layer, which can be anything from a few inches to a yard (meter) or more deep. The subsoil is that part of the soil which lies immediately below the topsoil surface. It is less fertile than the topsoil, sometimes completely sterile, although its fertility can be improved with the addition of organic matter.

Soil testing Soil testing can mean any examination of the soil, such as rubbing it between the fingers to assess texture, or digging a hole to determine drainage. Generally, however, soil testing refers to analysis to determine the chemical make-up of the soil, particularly the amount of lime, phosphates and potash. Various testing kits are available to the home grower for carrying out these chemical tests.

soil testing kit

Spit This is a gardener's term denoting one spade's depth of soil, and instructions for digging are sometimes given in spits, i.e., dig the soil to one spit deep. A conventional spit is10-12 in (25-30 cm).

Sport In gardening, sport refers to a plant which differs in character from the normal members of the same type. The biological term for this change is 'mutation' and it takes place because of a change in character of one or more genes carried in the chromosomes of the plant. A sport can frequently be vegetatively propagated by taking cuttings or grafting buds or scions of the particular plant which has changed.

peach *nectarine (peach sport)*

Spur In the fruit garden, spur refers to the fruit buds which form in clusters on a short length of shoot. One spur may develop out of another, and thus a spur system, a collection of short fruiting shoots forms. On older branches of apple and pear trees, spur systems can become very complex, and the fruit is congested and small from overcropping. To avoid this, spur systems should be shortened during pruning, and the oldest systems should be removed completely. The word spur is also used botanically for the tubular part of a flower which contains nectar, and which attracts insects.

shortening overgrown fruiting spurs

Staking and Tying When plants are not sturdy enough to support themselves throughout growth, they must be held upright by tying them to stakes. Young plants, in particular young fruit trees, may need staking until the root systems become established. In the vegetable garden, plants such as pole beans and peas need stakes, and sometimes a trellis, to climb, while tomatoes require staking because the plants are not strong enough to support the weight of the crop.

Bamboo canes are commonly used for staking, although heavy plants and trees will require stronger stakes. Plants can be attached to the canes with soft cord or twine, or with special rubber or plastic ties. Care should be taken that they are not tied in too tightly, or the plant may be damaged.

Standard Standard is a gardener's term for a tree or shrub grown on a bare stem 3-6 ft (1-1.8 m) high. Fruit trees are often trained as standards by removing the lower shoots as the tree grows. In any case, most trees left untrained will assume a standard habit as they age, as the lower and older branches tend to die first.

typical standard fruit tree

Sterile This word has two meanings to the gardener. A plant which is incapable of bearing seed is described as sterile; male plants are automatically sterile. Sterility can also occur because of distortion of the sexual parts of the plants, or because the pollen is malformed. Some plants, particularly certain varieties of fruit, are unable to set fruit it they are pollinated by their own pollen, and these are described as self-sterile. They set fruit only if pollinated by another variety.

Sterile is also used to describe soil which has been treated either chemically or mechanically so that the insects, bacteria, fungi and any seeds present in it are killed.

Stool This is a mother plant used solely for propagation purposes. The main stem is cut down to a stump; the stems which form from the buds produced at the base of the stump or just below soil level are earthed up as they grow. This encourages roots to appear on the stems, which can then be detached in autumn and used as stocks. Stooling is not common today.

Stopping

Stopping is the severance of a growth on a plant so that the plant ceases to produce further growth in the same direction. If the growth is soft and green, then the stopping can be done with the finger and thumb, and is called 'pinching' or 'pinching out.' If the growth is more mature, a knife or shears may be needed, and, in the case of trees, a saw may be necessary. Stopping may be done in the training of fruit trees, or in plants like tomatoes, to limit growth of foliage and shoots. This forces the plant's energy into the production of flowers and fruit.

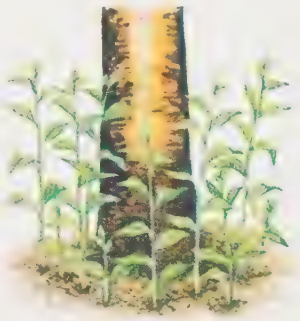
stopping a grapevine

Successional sowing

Successional sowing is a means of prolonging the harvesting period of a particular vegetable. It involves sowing or planting the same, or different, cultivars of the same plant at intervals which follow regularly one after the other. Cropping then extends over a long period. For example, successional sowings of quick-growing crops such as lettuce and radish can be made on and off through much of the summer to ensure a continuous supply of salad plants. Sowing first-early, then second-early, and finally maincrop potatoes, is a form of successional sowing. In the fruit garden, summer-fruiting strawberries can be followed by autumn-fruiting, or 'everbearing' ones.

Sucker

A sucker is a secondary shoot which emanates from below ground level, usually from a root, at or near the base of a plant. Although suckers are sometimes desirable, as with raspberry suckers which are used for propagation, usually they are unwanted and must be removed to avoid excess and useless growth. Suckers are sometimes encouraged to appear by hoeing too deeply, which damages the roots; eliminating them often means severing completely the portion of root from which the sucker is growing. Suckers are troublesome with trees and shrubs which have been grafted, as with most fruit trees.



fruit tree suckers

Systemic

In the garden, systemic describes a substance which enters a plant through the roots, leaves, etc., and then spreads throughout the tissues of the plant to combat pests and diseases. The substance is taken into the plant's sap and, hence, systemics are commonly used to kill sap-sucking insects such as aphids. There are also systemic fungicides. However, with the exception of tomatoes, systemics are permitted only on ornamental plants in the U.S.

Taproot

When a seed germinates, it begins growth by extending down into the soil. This extension is the taproot, from which the plant draws its nourishment. Fine, hairlike growths may appear on the surface of the taproot; these are called *secondary roots.* Taproots can grow very deep into the soil; some weeds, such as docks, are particularly difficult to eradicate for this reason. In the vegetable garden, taproots of biennial plants are grown and harvested as food crops; these include carrot, parsnip, turnip and rutabaga.

taproot

Tender

In gardening, 'tender' refers to a plant which is liable to be injured by frost, or by the cold of an average winter. As a general rule, the planting of tender crops should be timed so that they do not have to survive a winter in the ground, or alternatively, are given protection if frost threatens. However, plants which are tender in northern climates may not be classified as such in southern ones, so it is difficult to make a general rule applicable to a particular plant under all possible growing conditions. Fruits and vegetables which are native to the tropics or subtropics are virtually always tender in temperate climates; peppers, eggplants and melons are examples.

Terminal

Terminal is applied to the bud, leaf or flower at the end of a branch. This location distinguishes it from other buds, leaves and flowers which grow laterally (to one side) further down the stem. Terminal buds on fruit trees may either be growth buds, which will produce further vegetative growth, or flower buds, which will be followed by fruit.

Thinning

The reduction of the number of seedlings, plants, buds, flowers, fruitlets, stems, branches or trees can all be referred to as thinning, which is an important process in the garden. Thinning of seedlings is the most common operation; a certain number of the young plants are removed at an early stage to avoid overcrowding and poor crops. Young fruitlets are also reduced in numbers for the same reasons; it is done to ensure that the individual fruits remaining have room to develop to a good size.

Tilth

This is the name used to describe the structure of the cultivated surface soil. Good tilth is produced by careful cultivation of the soil; it is free of large stones and clods of earth, and has a fine, crumblike texture. A good tilth is necessary for seed sowing and for transplanting young seedlings. Generally prepared after digging, soil in good tilth must be well drained and will also need regular dressings of well-rotted animal manure or garden compost to remain in good tilth.

Top dressing

Any dressing applied to the surface of the soil, without disturbing the roots of growing plants, is a top dressing. Lime is often applied as a top dressing on the vegetable plot in winter or early spring; fertilizers are also applied to improve the nutrient content of the soil. Top dressings can also consist of bulky materials, such as well-rotted manure, compost, peat or straw; it's purpose is to feed growing plants, improve soil structure, retain moisture, and discourage weed growth. There is little difference between this type of dressing and a mulch.

Trace elements

Many substances necessary for healthy plant growth are required only in minute quantities, or traces, by the plants. These elements include iron, manganese, copper, zinc, boron, molybdenum, chlorine and cobalt. Disturbance of the balance of trace elements in the soil can lead to chlorophyll deficiency, causing the leaves of growing plants to turn yellow. Shortages, or excesses, of trace elements can also lead to other trouble, including stunted growth, and even death. Fortunately, trace elements are generally present in sufficient quantities in most soils, and any imbalances can usually be corrected by ensuring that a good mixture of organic matter and fertilizers is applied to the soil. Fritted forms of trace elements can be applied in extreme cases.

Training

Training is a way of controlling the shape and size of growing plants by means of pruning, or by tying to supports such as stakes and wires. Fruit trees are nearly always trained to control their growth and cropping. Growing climbing plants such as beans and peas against post and wire supports, and pinching out the sideshoots of tomatoes, are also forms of training. Plants rarely grow as the gardener would like on their own accord. Training is how to make them grow in the most convenient way.

True leaves

True leaves can be defined as the leaves on a mature plant. It is important to distinguish the true leaves from the seed leaves, or cotyledons, of a young plant. The seed leaves, either one or two, are the first leaves to appear on a seedling, and they differ from the true leaves in that they are simpler, and have entire margins. Instructions for pinching out usually refer to either the seed leaf stage, or to the time when, or just after, the first true leaves appear. All the leaves produced by a plant after the first one or two, the cotyledons, are true leaves.

Young squash seedling

Truss

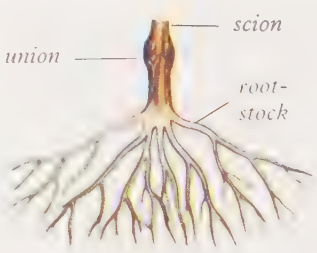
This is a general term applied to a cluster of fruit, such as a truss of tomatoes. It is usually applied to fruit from plants where the flowers are also formed in clusters. Tiny fruit, such as currants, are also borne in clusters, but these are usually referred to as strigs. Likewise grapes, which are borne in clusters, are called bunches rather than trusses.

Umbelliferae

All members of this family of plants bear clusters of flowers, each cluster on a stalk radiating out from a central stem, rather like an umbrella. Members of the *Umbelliferae* family include caraway, dill and coriander, usually grown for their seeds, and parsley, fennel, chervil and lovage, grown for their leaves.

flower head of fennel

Union To the fruit gardener, union refers to the point where the scion, or top part of the tree, is joined onto the rootstock, or bottom part, either by grafting or budding. When planting a tree, it is important to recognize the point of union, which should be placed at least 4 in (10 cm) above the soil. If the scion comes in contact with the soil, it may produce its own roots, by-passing the rootstock and thus eliminating the results desired from grafting.



Variety In the system of classification for plants, the variety is the one which most concerns the home grower. It is important to choose varieties of a species of fruit or vegetable which are suitable for a particular purpose. The choice depends on such factors as the desired cropping period, conditions in the garden and local climate. In the fruit garden, certain fruit trees will not produce fruit if pollinated by a tree of the same variety, so trees of different varieties must be planted. Where a succession of year-round crops, such as lettuce, is required, growing the right varieties is important.

Weed A weed is any plant growing where it should not grow. By this definition, a tomato growing in a strawberry bed is a weed. However, this term is usually reserved for certain plants which are never cultivated, but appear in the garden. There are three main groups: annuals, which germinate in the spring and die in the autumn; biennials, which can store food for a second year of growth; and perennials, which live for more than two seasons. Weeds are a nuisance because they may overgrow and shade cultivated plants, deprive them of minerals and moisture, and harbor pests and diseases.

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